FARR

TECHNICAL MANUAL

KT-20000

20” (50.8cm) 50K

Hydraulic Power Tong (BJ SPEC)

- Specifications
- Operation
- Maintenance
- Assembly

mccoyglobal.com

©2010 McCoy Corporation. All rights reserved.
Published by McCoy Corporation, Technical Publications Department
14755 121A Avenue • Edmonton, AB, Canada T5L 2T2

MCCOY
MOVING GLOBAL ENERGY FORWARD

This manual covers the following models:

TONG MODEL	REV	DESCRIPTION
80-1304BJ	5	Tong is equipped with Staffa B080 motor, motor valve, lift cylinder valve, chain sling, dump valve, and BJ-type safety door system.

NOTE: **Some illustrations used in this manual may not exactly match your model of tong.**

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

This page intentionally left blank

WARNINGS

A "LOAD-BEARING DEVICE" IS A CHAIN SLING, RIGID SLING, SPREADER BAR ASSEMBLY, FRAME, OR ANY OTHER DEVICE THAT BEARS THE PARTIAL OR TOTAL WEIGHT OF THE EQUIPMENT FOR WHICH THIS MANUAL HAS BEEN PRODUCED

THE LOAD-BEARING DEVICE SUPPLIED BY MCCOY DRILLING & COMPLETIONS IS DESIGNED TO SUPPORT THE EQUIPMENT DESCRIBED IN THIS MANUAL. MCCOY WILL NOT GUARANTEE THE ABILITY OF THE LOAD-BEARING DEVICE TO SUPPORT ANY OTHER PART, ASSEMBLY OR COMBINATION OF PARTS AND ASSEMBLIES. MCCOY WILL NOT GUARANTEE THE ABILITY OF THE LOAD-BEARING DEVICE TO LIFT OR SUPPORT THE EQUIPMENT DESCRIBED IN THIS MANUAL IF THERE ARE ANY MODIFICATIONS TO THE LOAD-BEARING DEVICE, OR ANY ADDITIONS TO THE EQUIPMENT DESCRIBED IN THIS MANUAL THAT ADD WEIGHT TO THE EQUIPMENT, UNLESS SUPPLIED BY MCCOY.

WHEN RE-ASSEMBLING LOAD-BEARING DEVICES (CHAIN SLINGS, RIGID SLINGS, BACKUP LEGS, ETC.) NOTE THAT THE ASSOCIATED FASTENERS MUST BE TIGHTENED TO THE CORRECT TORQUE SPECIFIED FOR THAT SIZE OF FASTENER (SEE SECTION 3 - OVERHAUL). ANY THREADED FASTENER IN A LOAD-BEARING DEVICE MUST BE SECURED WITH RED OR BLUE LOCTITE™.

ANY REPLACEMENT FASTENER (BOLTS, NUTS, CAP SCREWS, MACHINE SCREWS, ETC.) USED DURING MAINTENANCE OR OVERHAUL MUST BE GRADE 8 OR EQUIVALENT.

MCCOY DRILLING & COMPLETIONS | FARR
MOVING GLOBAL ENERGY FORWARD

This page intentionally left blank

© Copyright 2008 Farr Canada (A Division Of McCoy Corporation), all rights reserved. This document is the property of Farr Canada and is supplied as reference information for users of our products. This document and the contents within are considered confidential information, not to be disclosed, copied, transmitted, transcribed in any form, or stored on any type of data storage media without the express written consent of Farr Canada.

While continually striving to maintain accuracy, Farr Canada hereby states that the information contained in this technical documentation is subject to change without notice. If you feel this document does not meet your needs, please contact our sales office for the most current available documentation for your product.

Summary Of Revisions

Date	Section	Page	Description Of Revision
January 2008	N/A	N/A	Intial Release
February 2011	All	All	Replaced manual logos with new badging and updated format
	All	All	Improved safety symbology throughout
	Intro	xi	Added Table of Illustrations
	1.0	1.3	Revised and updated specification page
	2.0	ALL	Moved Section 2, “Tong Assembly”, to the Maintenance section. Renumbered “Setup & Operation” as Section 2.
	2.0	2.1	Added “Sling / Load Bearing Safety” section
	2.0	2.11	Renamed “Jaw Removal/Installation to “Jaw Removal & Die Replacement. Revised procedure.
	2.0	2.12	Added section “Tong Rig-Up & Leveling”
	2.0	2.16	Replaced “valve operation” images to reflect current tong model.
	2.0	2.17	Added section “Shifting Gears”
	2.0	2.18	Added section “Making and Breaking Connections”
	3.0	ALL	Renumbered “Maintenance” as Section 3.
	3.0	3.1	Added section “General Maintenance Safety Practices”.
	3.0	3.1	Added section “Preventive Maintenance”.
	3.0	3.3	Replaced “support roller lubrication” images to reflect current tong model
	3.0	3.6	Replaced “shifting shaft lubrication” image to reflect current tong model
	3.0	3.6	Added Jaw Roller lubrication instruction
	3.0	3.7	Added Door Cylinder lubrication instruction
	3.0	3.7	Replaced “Brakeband Adjustment” image to match current model
	3.0	3.8	Replaced “Door Latch Adjustment” image to match current model
	3.0	3.8	Added instruction for properly aligning doors.
	3.0	3.10	Added instruction for adjusting shifter detent force
	3.0	3.10	Added instruction for adjusting safety door switch
	3.0	3.12	Revised and improved “Assembly Procedures” to reflect changes to tong model.
	3.0	3.23	Added section “Daily Inspection & Maintenance Checklist (Power Tong)”
	3.0	3.25	Added section “Monthly Maintenance Checklist (Power Tong)”
	3.0	3.28	Added section “Daily Inspection & Maintenance Checklist (Power Unit)”
	3.0	3.29	Added section “Tubular Connection Equipment De-commissioning Procedure”
	3.0	3.32	Added section “Tubular Connection Equipment Re-commissioning Procedure”
	4.0	ALL	Renumbered “Troubleshooting” as Section 4.
	4.0	ALL	Removed irrelevant troubleshooting procedures and revised remaining procedures.

Continued on next page

DRILLING & COMPLETIONS | FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Summary Of Revisions (Continued)			
Date	**Section**	**Page**	**Description Of Revision**
FEB2011	6.0 (OLD)	ALL	OLD Section 6, "Storage Recommendations" has been removed. See Section 3.L for preservation and storage instructions.
	5.0	ALL	Renumbered "Parts & Assemblies" as Section 5.
	5.0	5.4 - 5.5	Revised "Support Roller" assembly images and part numbers to reflect changes to current tong model.
	5.0	5.6 - 5.7	Revised "Door Pivot Roller" assembly images and part numbers to reflect changes to current tong model.
	5.0	5.16 - 5.17	Revised "Shifter" assembly images and part numbers to reflect changes to current tong model.
	5.0	5.18 - 5.21	Revised "Tong Body" assembly images and part numbers to reflect changes to current tong model.
	5.0	5.26 - 5.27	Revised "Motor & Motor Mount" assembly images and part numbers to reflect changes to current tong model and include omitted parts
	5.0	5.28 - 5.29	Revised "Hydraulic" assembly images and part numbers to reflect changes to current tong model.
	5.0	5.30 - 5.31	Revised "Tong Door" assembly images and part numbers to reflect changes to current tong model.
	6.0	ALL	Renumbered "Torque Measurement" as Section 6.
	7.0	ALL	Renumbered "Hydraulic Components" as Section 7.

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

The information presented in this document will provide setup, operating, and maintenance instructions for your KT-20000 tong. Due to the wide variety of operating conditions, these instructions must be considered guidelines rather than absolute operating procedures. It is the responsibility of the user to use these guidelines together with an experienced manager to develop operating procedures that conform to all policies set forth by the operating authority (ies).

IDENTIFICATION OF OF WARNINGS AND OTHER NOMENCLATURE OF IMPORTANCE USED IN THIS INSTALLATION GUIDE

McCoy Drilling & Completions uses three indicators to describe items of three degrees of importance.

*A **HAZARD** to operators or equipment is represented by an exclamation point within a red triangle. identifies items of the highest importance. Failure to heed information identified by a **HAZARD** symbol may result in bodily injury, death, catastrophic equipment damage, or any combination of these. A **HAZARD** may also indicate the potential for dangerous environmental contamination.*

This identifies a HAZARD to operators or equipment

*A **WARNING** is represented by an exclamation point within an orange triangle, and contains information that will alert personnel to a potential safety hazard that is not life-threatening. A **WARNING** may also serve to alert the user to information critical to the correct assembly or operation of the equipment in use.*

This identifies a WARNING to users

*A **CAUTION** is represented by an exclamation point within a yellow triangle and highlights information that may aid the user during assembly or operation of your equipment. CAUTIONs are also used to ensure common errors are not made during assembly or operation of your equipment.*

This identifies a CAUTION to users

Observance of the following is the full responsibility of the user:

- ***all descriptions, information and instructions set out in this manual***
- ***any regulation or requirement issued by an authority or agency which may influence operation, safety or integrity of the equipment that overrules the content of this document.***
- ***any legal or other mandatory regulation in force governing accident prevention or environmental protection.***

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Introduction & Specifications . . . . . **Section 1**
Introduction & Company Information 1.1
Dimensional Views 1.2
Equipment Specifications 1.3
Lubrication Specifications 1.4
Setup & Operation . . . . . **Section 2**
Sling / Load Bearing Device Safety 2.1
Major Component Identification 2.4
Hydraulic Schematic / Component Identification 2.7
Hydraulic Connections 2.10
Tong Jaw Availability & Installation 2.11
Tong Rig-Up & Leveling
1. Suspension & Restraint 2.12
2. Tong Leveling 2.14
Tong Operation
1. Initial Start-up & Break-In 2.15
2. Valve Operation 2.15
3. Shifting Gears 2.17
4. General Operational Comments 2.17
Making and Breaking Connections
1. Making A Connection 2.18
2. Breaking A Connection 2.23
Extreme Cold Weather Operation Procedures 2.25
Maintenance . . . . . **Section 3**
General Maintenance Safety Practices 3.1
Cleaning 3.1
Preventive Maintenance 3.1
Lubrication 3.2
Adjustments
1. Brakeband Adjustment 3.7
2. Door Latch Adjustment 3.8
3. Door Alignment 3.8
4. Shifter Detent Adjustment 3.10
5. Safety Door Switch Adjustment 3.10
Recommended Periodic Checks 3.11
Disassembly & Overhaul Procedures 3.12
Assembly Instuctions 3.14
Daily Tong Inspection & Maintenance Checklist 3.23
Monthly Tong Inspection & Maintenance Checklist 3.25
Daily Power Unit Inspection & Maintenance Checklist 3.28
De-commissioning & Storage Procedures 3.29
Re-commissioning Procedures 3.32
Troubleshooting . . . . . **Section 4**
Tong Will Not Develop Sufficient Torque 4.1
Failure Of Jaws To Grip Pipe 4.3
Tong Running Too Slowly 4.4
Failure Or Difficulty Of Tong To Shift 4.5
General Comments 4.6
Assemblies And Parts . . . . . **Section 5**
Geartrain Layout 5.2
Support Roller Assembly 5.4
Door Pivot Roller Assembly 5.6
Rotary Idler 5.8
Pinion Idler 5.10
Pinion Assembly 5.12
Clutch Assembly 5.14
Shifting Assembly 5.16
Tong Body Assembly 5.18
Brakeband Assembly 5.22
Cageplate Assembly 5.24
Motor & Motor Mount 5.26
Hydraulic Assembly 5.28
Tong Door Base Assembly 5.30
Safety Door Components 5.32
Chain Sling Assembly 5.34

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Table of Contents (Continued):

Torque Measurement Section . . . . . Section 6
Hydraulic Component Information . . . . . Section 7

TABLE OF ILLUSTRATIONS

ILLUSTRATION 1.A.1: KT-20000 TONG 1.1
ILLUSTRATION 1.A.2: KT-20000 TONG DIMENSIONS 1.2
ILLUSTRATION 2.A.1: SLING ANGLE 2.1
ILLUSTRATION 2.B.1: COMPONENT IDENTIFICATION 01 . . . . . 2.4
ILLUSTRATION 2.B.2: COMPONENT IDENTIFICATION 02 . . . . . 2.5
ILLUSTRATION 2.B.3: COMPONENT IDENTIFICATION 03 . . . . . 2.5
ILLUSTRATION 2.B.4: COMPONENT IDENTIFICATION 04 . . . . . 2.6
ILLUSTRATION 2.C.1: HYDRAULIC SCHEMATIC 2.7
ILLUSTRATION 2.C.2: HYDRAULIC COMPONENT IDENTIFICATION 01 . . . . . 2.8
ILLUSTRATION 2.C.3: HYDRAULIC COMPONENT IDENTIFICATION 02 . . . . . 2.8
ILLUSTRATION 2.C.4: HYDRAULIC COMPONENT IDENTIFICATION 03 . . . . . 2.9
ILLUSTRATION 2.C.5: HYDRAULIC COMPONENT IDENTIFICATION 04 . . . . . 2.9
ILLUSTRATION 2.C.6: HYDRAULIC COMPONENT IDENTIFICATION 05 . . . . . 2.10
ILLUSTRATION 2.D.1: HYDRAULIC CONNECTIONS 01 . . . . . 2.10
ILLUSTRATION 2.D.2: HYDRAULIC CONNECTIONS 02 . . . . . 2.11
ILLUSTRATION 2.E.1: JAW REMOVAL 2.12
ILLUSTRATION 2.F.1: TONG SUSPENSION RELATIVE TO AXIAL CENTRE 2.13
ILLUSTRATION 2.F.2: TONG SUSPENSION RELATIVE TO VERTICAL CENTRE 2.13
ILLUSTRATION 2.F.3: LEVELING TONG USING TURNBUCKLES 2.14
ILLUSTRATION 2.G.1: TONG ROTATION (MOTOR) CONTROL 2.16
ILLUSTRATION 2.G.2: TONG LIFT CYLINDER CONTROL 2.16
ILLUSTRATION 2.H.1: MASTER LIFTING LINK 2.18
ILLUSTRATION 2.H.2: SETTING BACKING PIN TO "MAKE-UP" POSITION 2.19
ILLUSTRATION 2.H.3: LIFT CYLINDER CONTROL - RAISE 2.19
ILLUSTRATION 2.H.4: OPENING TONG DOORS 2.20
ILLUSTRATION 2.H.5: MOTOR CONTROL - MAKE-UP 2.21
ILLUSTRATION 2.H.6: MOTOR CONTROL - RELEASING JAWS 2.21
ILLUSTRATION 2.H.7: LIFT CYLINDER CONTROL - LOWER 2.22
ILLUSTRATION 2.H.8: SETTING BACKING PIN TO "BREAK-OUT" POSITION 2.23
ILLUSTRATION 2.H.10: RELEASING TONG JAWS FOLLOWING BREAK-OUT & UNTHREADING 2.24
ILLUSTRATION 2.H.9: ROTATION CONTROL - BREAK-OUT 2.24
ILLUSTRATION 2.H.11: LOWERING TONG USING LIFT CYLINDER CONTROL 2.25
ILLUSTRATION 3.D.1: CAGEPLATE CAM FOLLOWER LUBRICATION 3.2
ILLUSTRATION 3.D.2: ROTARY GEAR LUBRICATION 3.2
ILLUSTRATION 3.D.3: SUPPORT ROLLER LUBRICATION 3.3
ILLUSTRATION 3.D.4: DOOR PIVOT ROLLER LUBRICATION 3.3
ILLUSTRATION 3.D.5: ROTARY IDLER LUBRICATION 3.4
ILLUSTRATION 3.D.5: PINION IDLER LUBRICATION 3.4
ILLUSTRATION 3.D.6: PINION LUBRICATION 3.5
ILLUSTRATION 3.D.7: CLUTCH LUBRICATION 3.5
ILLUSTRATION 3.D.8: SHIFTER COMPONENT LUBRICATION ACCESS 3.6
ILLUSTRATION 3.D.9: JAW ROLLER LUBRICATION 3.6
ILLUSTRATION 3.D.10: DOOR CYLINDER 3.7
ILLUSTRATION 3.E.1: BRAKEBAND ADJUSTMENT 3.7
ILLUSTRATION 3.E.2: DOOR LATCH ADJUSTMENT CAMS 3.8
ILLUSTRATION 3.E.3: DOOR ALIGNMENT MEASUREMENT POINTS 3.9
ILLUSTRATION 3.E.4: DOOR ALIGNMENT ADJUSTMENT SET SCREWS 3.9
ILLUSTRATION 3.E.5: SHIFTER DETENT ADJUSTMENT 3.10
ILLUSTRATION 3.E.6: SHIFTER DETENT ADJUSTMENT 3.11
ILLUSTRATION 3.H.1: CAM FOLLOWER INSTALLATION - BOTTOM PLATE 3.14
ILLUSTRATION 3.H.2: ROTARY GEAR & SUPPORT ROLLER INSTALLATION 3.15
ILLUSTRATION 3.H.3: TURN COUNTER ENCODER & ROTARY IDLER INSTALLATION 3.16
ILLUSTRATION 3.H.4: CAM FOLLOWER INSTALLATION - TOP PLATE 3.17
ILLUSTRATION 3.H.5: TOP PLATE FASTENER EXCLUSIONS 3.17
ILLUSTRATION 3.H.6: INSTALLATION OF HORIZONTAL CAM FOLLOWERS AND GUIDES 3.18
ILLUSTRATION 3.H.7: SUPPORT ROLLER - BRAKEBAND WELDMENT INSTALLATION 3.18
ILLUSTRATION 3.H.8: SHIFTER PIVOT LUG WELDMENT INSTALLATION 3.19
ILLUSTRATION 3.H.9: TOP & BOTTOM CAGEPLATE INSTALLATION 3.20
ILLUSTRATION 3.H.10: DOOR CYLINDER POST INSTALLATION 3.20
ILLUSTRATION 3.H.11: SAFETY DOOR VALVE INSTALLATION 3.21

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

This page intentionally left blank

Congratulations on the purchase of your new Farr Canada 20" tong assembly. This unit will provide you with years of outstanding performance. Simple maintenance and care will extend its life and insure a continuing level of excellent performance and reliability.

This manual will assist you in giving your equipment the care it requires. Please read the manual and follow the enclosed maintenance instructions. Replacement parts are readily available from FARR Canada Ltd. in Edmonton Alberta. However, most of the parts that are subject to wear or damage are standard items likely to be found in supply stores or parts depots. Many parts are transferable between FARR tongs and backups.

Should you need replacement parts, or should you experience any difficulty not covered in this manual, please contact:

McCoy Drilling & Completions - FARR
14755 121A Avenue
Edmonton, Alberta
Canada T5L 2T2
Phone: 780.453.3277
Fax: 780.455.2432

Sales Fax: 780.481.9246
Email Engineering: engFarr@mccoyglobal.com
Email Sales: salesFarr@mccoyglobal.com
Customer Care: customerCareFarr@mccoyglobal.com

Website: http://www.mccoyglobal.com/index.php/drilling-completions

ILLUSTRATION 1.A.1: KT-20000 TONG

MCCOY | DRILLING & COMPLETIONS
FARR
MOVING GLOBAL ENERGY FORWARD

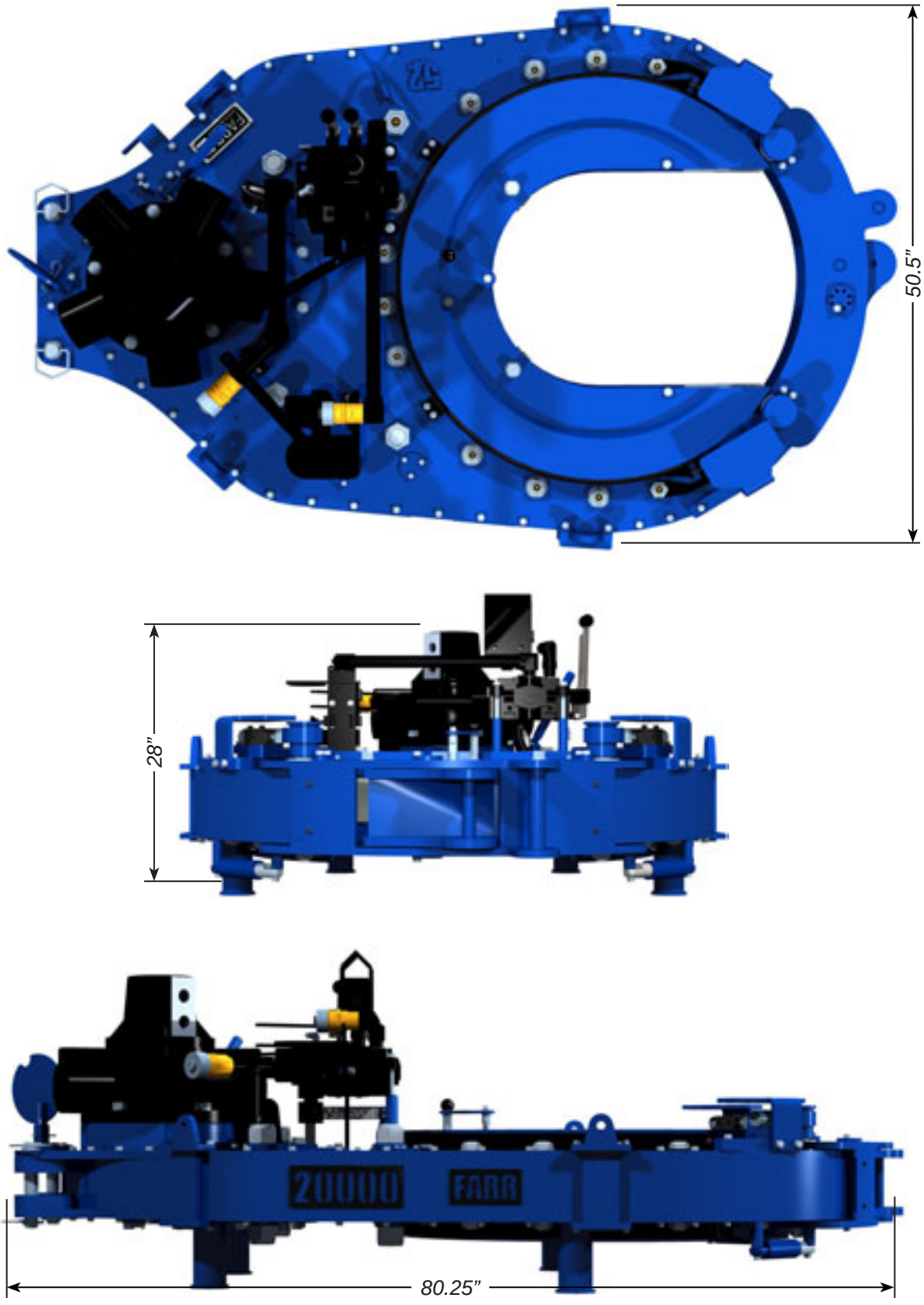


Illustration 1.A.2: KT-20000 Tong Dimensions

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Torque Table **

Pressure	High Gear		Low Gear	
PSI / MPa	Lbs.-ft.	Nm	Lbs.-ft.	Nm
1000 / 6.895	2600	3525	16900	22913
1500 / 10.342	4400	5965	28500	38640
2000 / 13.79	6200	8406	40200	54504
2500 / 17.237	8000	10846	51800	70231
MAXIMUM RATED TORQUE: 50000 LBS.-FT. / 67790 NM				

Speed Table

Flow (USGPM/LPM)	Low Gear	High Gear
10 / 37.9	1	8
20 / 75.7	3	17
40 / 151.6	5	33
60 / 227.4	8	50

**** THESE ARE IDEAL VALUES. ACTUAL ACHIEVED TORQUE IS HIGHLY DEPENDANT UPON TONG EFFICIENCY AND FINAL POSITION OF ROTARY GEAR WHEN FULL TORQUE LOAD IS REACHED.**

Hydraulic Requirements (max.):	60 US GPM @ 1000 psi (227 LPM @ 6.894 MPa) 10 US GPM @ 2500 psi (38 LPM @ 17.237 MPa)
Max Length:	80.25” inches / 203.8 cm (doors closed)
Height (Staffa Motor):	28” / 71.1 cm (chain sling not included)
Height (Rineer Motor):	25-3/8” / 64.5 cm (chain sling not included)
Overall Width:	50.5” inches / 128.3 cm
Space Required on Pipe:	10” / 25.4 cm
Maximum Elevator Diameter:	N/A
Torque Arm Length:	52 inches / 132.1 cm - Centerline of pipe to Centerline of anchor -
Recommended Spring Hanger:	Capacity 1000 - 2045 lb (273 - 500 kg) McCoy P/N 85-0106XXXH Double-Spring Hanger
Weight (Approximate):	3450 lb. / 1570 kg.
Casing Jaws Available (inches):	8-5/8” to 20” (See Pg. 3.6)

REPLACEMENT FASTENERS (BOLTS, NUTS, CAP SCREWS, MACHINE SCREWS, ETC.) MUST BE GRADE 8 OR EQUIVALENT

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Use an EP synthetic grease that meets or exceeds the following specifications:

Thickener	*Lithium Complex*
NLGI consistency grade	*2*
NLGI performance grade	*GC-LB*
Penetration - ASTM D 217 (25°C [77°F] 0.1 mm) worked 60 strokes	*265-295 minimum*
Dropping point, °F[°C] - ASTM D2265	*550 [288] minimum*
High temperature life, hours - ASTM D 3527	*160 minimum*
Oxidation stability, psi - ASTM D 942	*(100 hr/300 hr) 0/3*
Water washout, percent - ASTM D 1264	*1.8 max*
Rust and corrosion - ASTM D 1743	*pass*
Oil separation, percent loss - ASTM D 1742 (24 hours, 25°C [77°F]	*1.1 max*
Leakage, g lost - ASTM D 4290	*1.0 max*
Four ball wear test, mm scar - ASTM D 2266	*0.40 max*
Fretting wear, mg - ASTM D 4170	*3.4 max*
Four ball EP, kgf - ASTM D 2596	
Weld point	*400 minimum*
Load wear index	*50 minimum*
Timken OK load test, lbs - ASTM D 2509	*50*
*Low temperature torque, N*m - ASTM D 4693 (-40°C [-40°F])*	*1.3 max*
LT-37 pumpability, g/min (60°F/0°F [16°C/-18°C])	*360/7*
Copper corrosion - ASTM D 4048	*1B*
Disc brake wheel bearing specifications	
Ford ESA-M1C 198A	*Yes*
Chrysler MS-3701	*Yes*
Oil viscosity: 40°C [104°F], cSt	*151*
100°C [212°F], cSt	*19.2*
Flash point, °F[°C] - ASTM 92	*450[232]*

Use a premium quality hydraulic fluid that meets or exceeds the following specifications:

Typical Density (kg/m^3)	*878*
Viscosity - cSt @ 40 °C	*68.8*
- cSt @ 100 °C	*8.7*
Viscosity Index	*97*
Pour Point °F [°C]	*-22 [-30]*
Flash Point °F [°C]	*432 [222]*
Colour, ASTM	*1.5*
Neutralization Number	*0.40*
Rust Protection - Distilled Water	*No Rust*
- Sea Water	*No Rust*
Hydrolytic Stability - Cu Mass Loss, mg/cm^2	*0.04*
Copper Corrosion Test	*1A*
Filterability: Denison - Wet & Dry	*Pass*
Afnor - Wet & Dry	*Pass*
Cincinatti Milacron Spec Approved	*P69*
Denison HF-0:	*Approved*
Denison P-46 Piston Pump:	*Pass*
Denison T6C Vane Pump:	*Pass*
Vickers 35VQ25 Vane Pump Test:	*Pass*
104/105C Vane Pump Test:	*No Data Available*
Vane pump test total ring and vane wear, mg.	*<10*
Oxidation Stability	
Turbine Oil Stability Test Life, hours	*2500+*
Rotary Bomb Oxidation Test, minutes	*325*
FZG Spur Gear Test, Failure Load Stage (FLS)	*12*

DRILLING & COMPLETIONS | FARR
MCCOY MOVING GLOBAL ENERGY FORWARD

Adequate setup and proper hydraulic connections are essential in ensuring reliable operation of your tong. For best results and long term reliability, read and obey the start-up instructions in this section.

DO NOT ACCESS ROTATING COMPONENTS UNLESS HYDRAULIC POWER SUPPLY HAS BEEN DEACTIVATED OR ISOLATED.

A CLEARLY IDENTIFIED REMOTE POWER PACK EMERGENCY STOP MUST BE INSTALLED IN THE IMMEDIATE VICINITY OF THE TONG OPERATOR.

A. SLING / LOAD BEARING DEVICE SAFETY

THE SUPPLIED LOAD-BEARING DEVICE (CHAIN SLING, RIGID SLING, SPREADER BAR ASSEMBLY, FRAME, OR ANY OTHER DEVICE THAT BEARS THE PARTIAL OR TOTAL WEIGHT OF THE EQUIPMENT DESCRIBED IN THIS MANUAL) HAS BEEN SPECIFIED OR DESIGNED TO SUPPORT THE EQUIPMENT DESCRIBED IN THIS DOCUMENT. FARR WILL NOT GUARANTEE THE ABILITY OF THE LOAD-BEARING DEVICE TO SUPPORT ANY OTHER PART, ASSEMBLY OR COMBINATION OF PARTS AND ASSEMBLIES, OR ANY ADDITIONS TO THE EQUIPMENT DESCRIBED IN THIS MANUAL THAT ADD WEIGHT TO THE EQUIPMENT, UNLESS SUPPLIED BY MCCOY.

MCCOY DRILLING & COMPLETIONS DOES NOT GUARANTEE THE INTEGRITY OF MODIFIED OR DAMAGED LOAD-BEARING DEVICES, UNLESS THOSE MODIFICATIONS ARE PERFORMED BY MCCOY.

McCoy Drilling & Completions recommends following an industry-accepted standard such as OSHA, ASME B30.9-2006, or manufacturer's guidelines when performing any rigging and overhead lifting. Use by untrained persons is hazardous. Improper use will result in serious injury or death. Do not exceed rated capacity. Slings will fail if damaged, abused, misused, overused, or improperly maintained.

- *Only grade 80 or grade 100 alloy chain should be used for overhead lifting applications.*
- *Working Load Limit (WLL) is the maximum allowable load in pounds which may be applied to the load-bearing device, when the device is new or in "as new" condition, and when the load is uniformly and directly applied. The WLL must never be exceeded.*
- *Working Load Limit (WLL) is the maximum working load for a specific minimum sling angle, measured from the horizontal plane. The Working Load Limit is identified on the sling.*
- *The Working Load Limit or Design factor may be affected by wear, misuse, overloading, corrosion, deformation, intentional alterations, sharp corner cutting action and other use conditions.*
- *Shock loading and extraordinary conditions must be taken into account when selecting alloy chain slings.*
- *See OSHA Regulation for Slings 1910.184, ANSI/ASME B30.9-"SLINGS", ANSI/ASME B30.10-"HOOKS" and ANSI/AMSE B30.26 "RIGGING HARDWARE" for additional information.*

THE MINIMUM SLING ANGLE (THE ANGLE OF THE LEG OF THE SLING MEASURED FROM THE HORIZONTAL) MUST NEVER FALL LOWER THAN THE ANGLE SPECIFIED FOR THE SLING IN USE

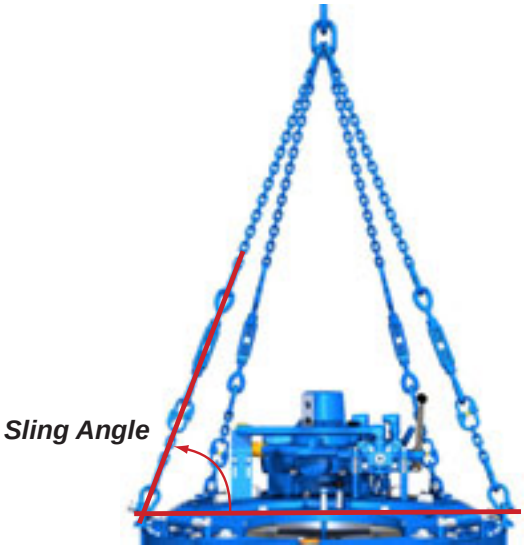


ILLUSTRATION 2.A.1: SLING ANGLE

DRILLING & COMPLETIONS | FARR
MCCOY MOVING GLOBAL ENERGY FORWARD

1. Inspection Of Slings

McCoy Completions & Drilling strongly recommends the following practices:

A complete inspection of new load-bearing devices and attachments shall be performed by a qualified, designated person prior to initial use. Each link and component shall be examined individually, taking care to expose and examine all surfaces including the inner link surface. The sling shall be examined for conditions such as those listed in the removal criteria below. In addition, daily inspection of slings, fastenings and attachments shall be performed by a designated person. If damage or defects are found at either inspection, the damaged or defective component shall be quarantined from service until it can be properly repaired or replaced.

Removal Criteria:

A load-bearing device shall be removed from service if conditions such as the following are present:

- *Missing or illegible sling identification.*
- *Cracks or breaks*
- *Evidence of tampering is seen - sling tag has been modified or obscured, or tamper-proof nuts are missing.*
- *Signs of impact on load-bearing components, including spreader bars, lifting lugs, rigid slings & rigid sling weldments, and legs & leg mounts.*
- *Broken or damaged welds.*
- *Excessive wear, nicks, or gouges. Refer to the chart below to ensure minimum thickness on chain links supplied is not be below the values listed:*

Minimum Allowable Chain Link Thickness at Any Point			
Nominal Chain Size		***Minimum Thickness***	
Inches	*MM*	*Inches*	*MM*
7/32	*5.5*	*0.189*	*4.80*
9/32	*7*	*0.239*	*6.07*
5/16	*8*	*0.273*	*6.93*
3/8	*10*	*0.342*	*8.69*
1/2	*13*	*0.443*	*11.26*
5/8	*16*	*0.546*	*13.87*
3/4	*20*	*0.687*	*17.45*
7/8	*22*	*0.750*	*19.05*
1	*26*	*0.887*	*22.53*
1-1/4	*32*	*1.091*	*27.71*
Refer To ASME B30.9			

- *Stretched, bent, twisted, or deformed chain links or components.*
- *Evidence of heat damage.*
- *Excessive pitting or corrosion.*
- *Lack of ability of chain or components to hinge (articulate) freely.*
- *Weld splatter.*
- *For hooks, removal criteria as stated in ASME B30.10*
- *Other conditions, including visible damage, that cause doubt as to the continued use of the sling.*

Inspect all lugs and fixing points for signs of elongation and/or bending, or for material build-up around the hole. Repair or replace components that appear distorted. Ensure all hardware is tight and in good condition. Replace missing hardware if necessary. All hardware must be free of rust and corrosion.

Additional inspections shall be performed during sling use where service conditions warrant. Periodic inspection intervals shall not exceed one year. The frequency of periodic inspections should be based on:

- *Frequency of use of the load-bearing device.*
- *Severity of service conditions*
- *Nature of lifts being made*
- *Experience gained on the service life of load-bearing devices used in similar circumstances.*

Guidelines for the interval are:

- *Normal Service - yearly*
- *Severe Service - monthly to quarterly*
- *Special Service - as recommended by a qualified person*

DRILLING & COMPLETIONS | FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Units designed and manufactured in accordance with EN 12079 and DNV 2.7-1 should be tested and examined in accordance with the following schedule of examination and test. The user of the load-bearing device shall place a permanent placard or plate upon which the type and date of the last test shall be recorded. To avoid confusion, the plate shall not carry the date of the next test or examination, only the most recent.

Test / Examination				
Time / Interval	Lifting Tests[1]	Non-Destructive Examination (NDE) of Lifting Points	Thorough Visual Examination	Suffix To Be Marked On Plate Attached To Unit
Initial Certification By Farr / Superior	YES	YES	YES	T
Interval Not Exceeding 12 Months	At the discretion of inspection body	At the discretion of inspection body	YES	T or VN[3]
Interval Not Exceeding 60 Months	At the discretion of inspection body	YES	YES	T or VN
Following Substantial Repair or Alteration[4]	YES	YES	YES	T

1. Lifting test as per S 7.3 BS EN 12079 or DNV 2.7-1 May 1995
2. T = Proof Test, non-destructive examination; VN = non destructive examination and visual examination; V = visual examination.
3. Dependant upon whether non-destructive examination has been carried out.
4. For the purposes of this standard, a substantial repair or modification is defined as any repair and/or modification that has been carried out which may, in the opinion of the inspection body, affect the load-bearing elements of the container or lifting device, or elements that contribute directly to its structural integrity.

IF MECHANICAL DAMAGE IS SEEN OR SUSPECTED ON A LOAD-BEARING DEVICE, OR IF THE LOAD-BEARING DEVICE HAS BEEN OVERLOADED, IT MUST BE REMOVED FROM SERVICE AND QUARANTINED UNTIL RECERTIFIED

Written records of the most recent periodic inspection shall be maintained, and shall include the condition of the sling.

2. *Proper Use Of Load-Bearing Devices*

Whenever any load-bearing device is used, the following practices shall be observed.

- *Load-bearing devices that are damaged or defective shall not be used.*
- *Slings shall not be shortened with knots or bolts or other makeshift devices.*
- *Sling legs shall not be kinked.*
- *Load-bearing devices shall not be loaded in excess of their rated capacities.*
- *Slings shall be securely attached to their load.*
- *Load-bearing devices shall be protected from snagging, and shall not be further obstructed by any object.*
- *Suspended loads shall be kept clear of all obstruction.*
- *All employees shall be kept clear of loads about to be lifted and of suspended loads.*
- *Hands or fingers shall not be placed between the sling and its load while the sling is being tightened around the load.*
- *Shock loading is prohibited.*
- *Do not stand directly under a load during lifting.*

3. *Storage Of Load-Bearing Devices*

Proper storage of out-of-service load bearing devices is important to ensure full integrity of the device once it is returned to service. Farr recommends observing the following practices:

- *Wipe off all excess grease. Use a solvent-based cleaner on rags to wipe all external surfaces to remove residual grease or hydraulic fluid. Once the outside surfaces have been de-greased, wipe all external surfaces with clean water to remove residual solvent.*
- *Farr recommends that an anti-corrosive agent such as Tectyl® 506 be applied to all external surfaces. Refer to manufacturer data sheets for proper application and safety information. Allow the anti-corrosive coating ample time to dry - refer to manufacturer data sheets for drying times at room temperature.*
- *Store in a clean, dry location. When returning to service, note that a full inspection of the device must be performed.*

DRILLING & COMPLETIONS | FARR
MCCOY MOVING GLOBAL ENERGY FORWARD

Adequate setup and proper hydraulic connections are essential in ensuring reliable operation of your tong. For best results and long term reliability, read and obey the start-up instructions in this section.

B. MAJOR COMPONENT IDENTIFICATION

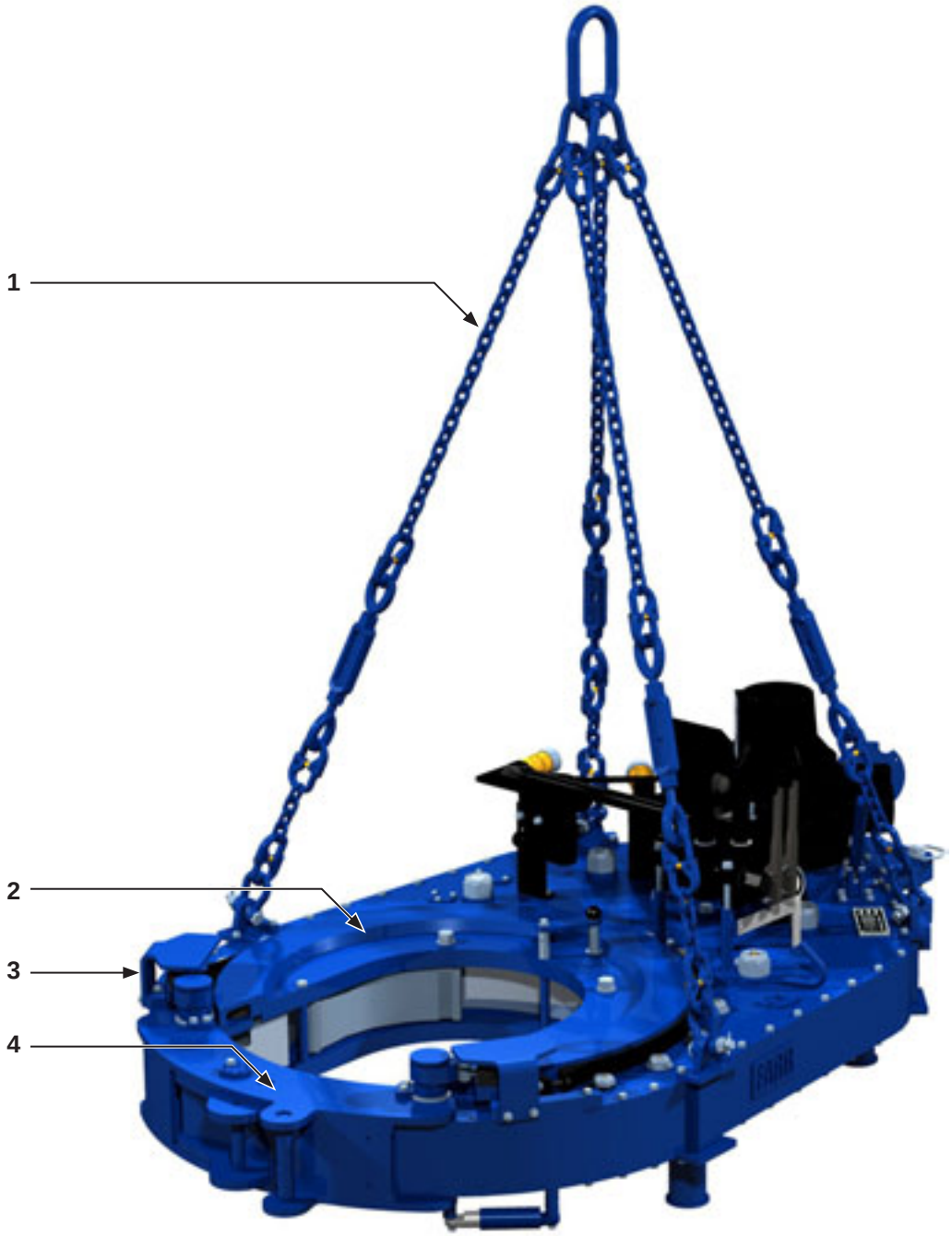


ILLUSTRATION 2.B.1: COMPONENT IDENTIFICATION 01

Item	Description
1	Chain Sling Assembly
2	Cageplate Assembly
3	Safety Door Switch & Guard Assembly (x2)
4	Double Door Assembly

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

MAJOR COMPONENT IDENTIFICATION Cont'd:

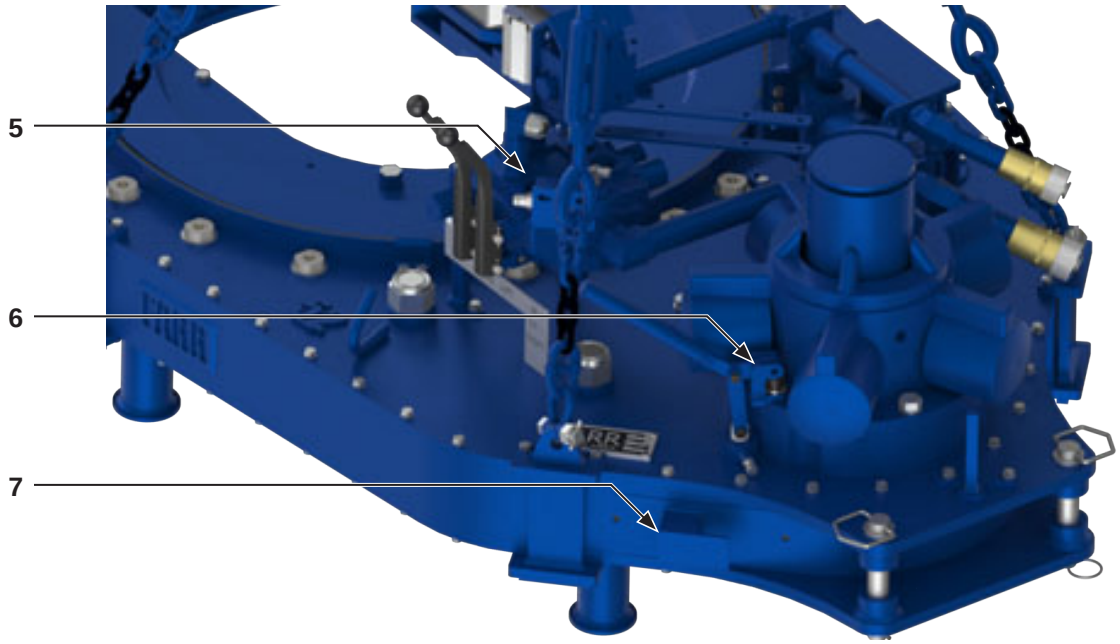


ILLUSTRATION 2.B.2: COMPONENT IDENTIFICATION 02

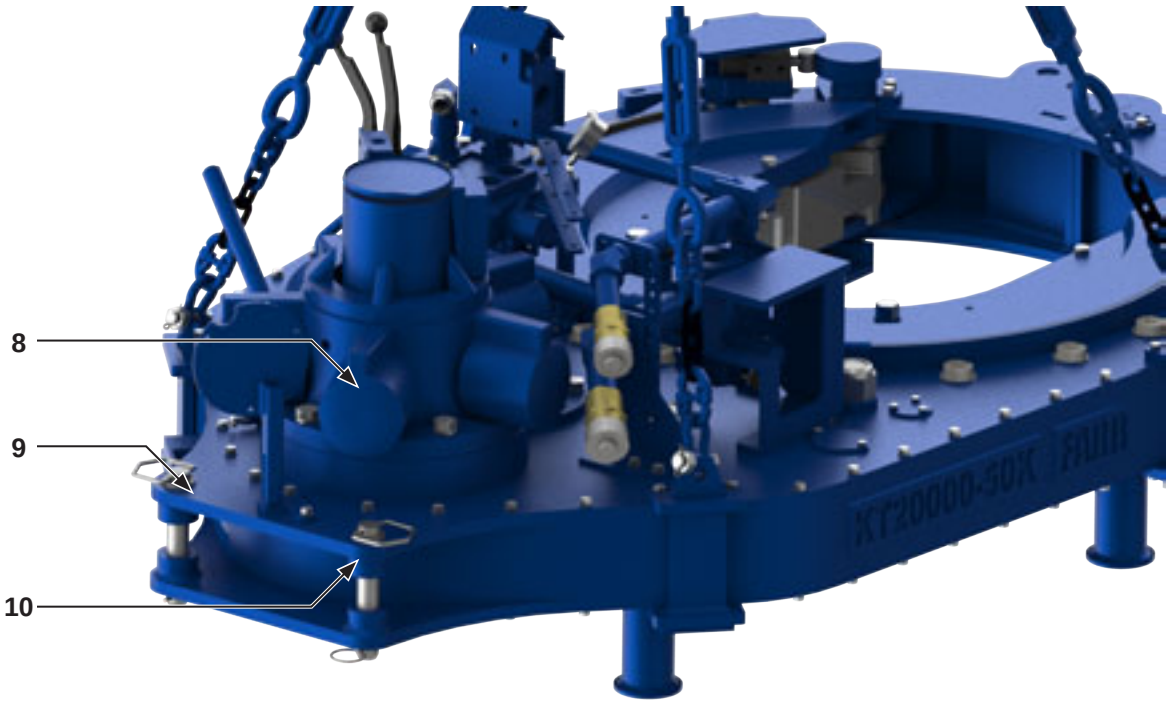


ILLUSTRATION 2.B.3: COMPONENT IDENTIFICATION 03

Item	Description
5	Valve Bank
6	Manual Shift Assembly
7	Access Panel
8	Staffa HMB 80 or Rineer GA125 Hydraulic Motor
9	Torque Gauge Mounting Plate
10	Motor Mount

MCCOY DRILLING & COMPLETIONS | FARR
MOVING GLOBAL ENERGY FORWARD

MAJOR COMPONENT IDENTIFICATION Cont'd:

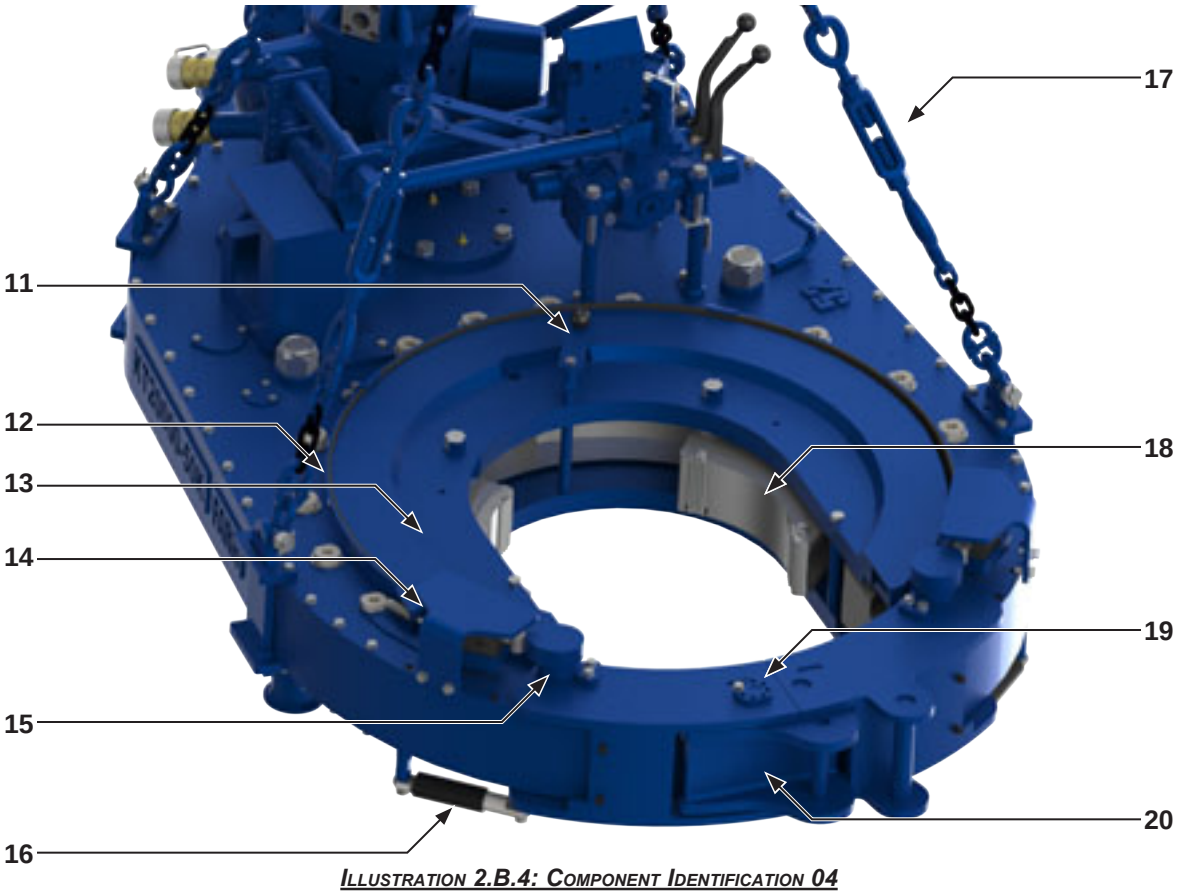


ILLUSTRATION 2.B.4: COMPONENT IDENTIFICATION 04

Item	Description
9	Backing Pin Assembly
11	Tong Jaw
12	
13	Brakeband
14	Tong Door Cylinder
15	Safety Door Valve Assembly
16	Safety Door Cam Weldment
18	Door Latch Adjustment Cam
19	Door Latch

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

C. HYDRAULIC SCHEMATIC / HYDRAULIC COMPONENT IDENTIFICATION

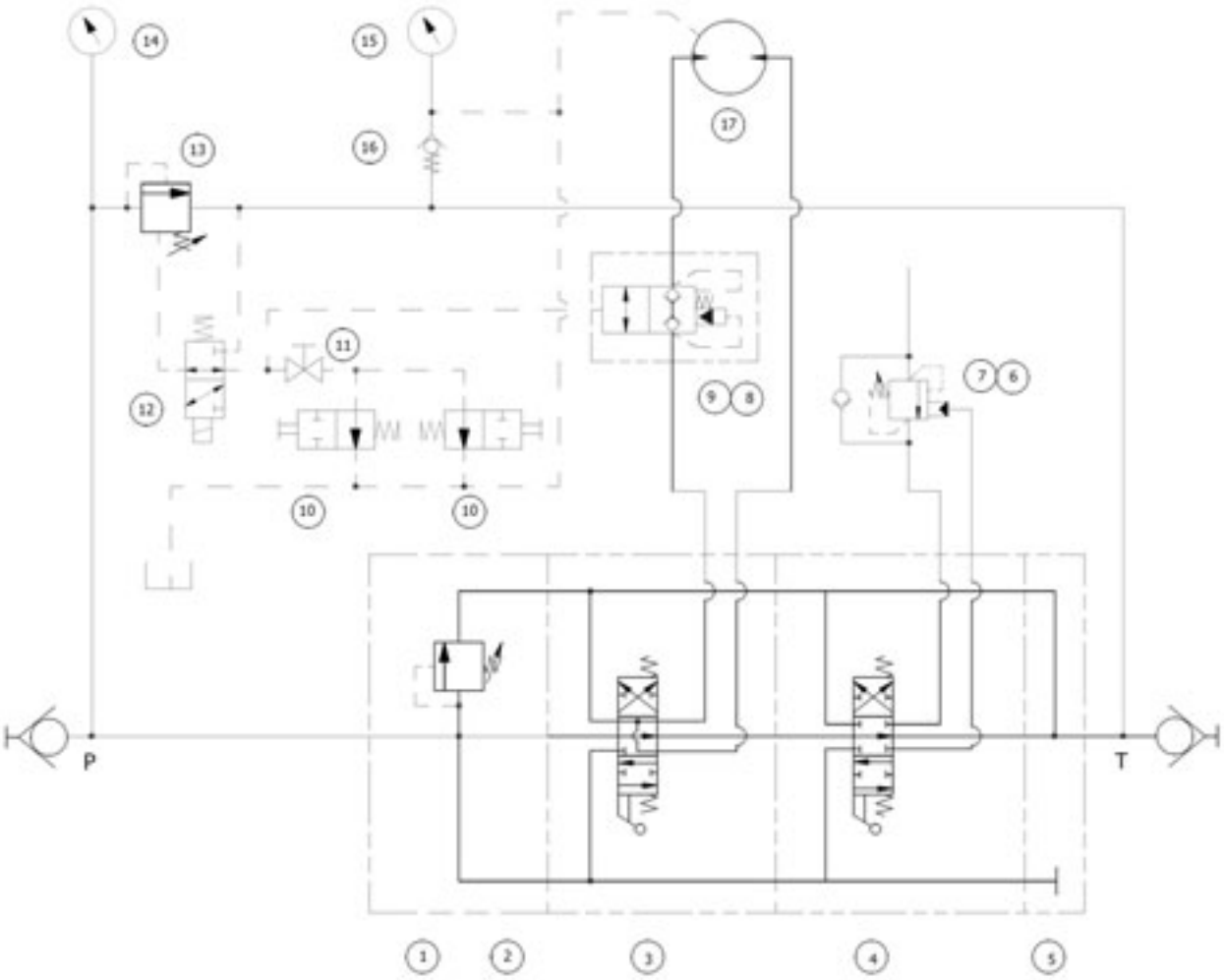


ILLUSTRATION 2.C.1: HYDRAULIC SCHEMATIC

ITEM	QTY	DESCRIPTION	PART NUMBER
1	1	DVA35-A880 Inlet Valve	10-9016
2	1	DVA35-MRV-2 Relief Valve	10-0062
3	1	DVA35-MA8 Motor Section Valve	10-9014
4	1	DVA35-DA8 Motor Section Valve	10-9019
5	1	DVA35-TR99 Outlet Valve	10-0086
6	1	CBCA-LHN Counterbalance Valve	08-1848
7	1	ECJ Valve Body	08-1807
8	1	LKHC-XDN Pilot -To-Open Check Valve	08-1625
9	1	HCM Valve Body	08-1829
10	2	VM503RC Safety Door Switch	08-0121
11	1	1/4" FNDT Ball Valve	SS-434F
12	1	Unloader Valve	W01321
13	1	Dump Valve	R4V-10-5A3-10-11G
14	1	3000 psi Pressure Gauge	02-0245
15	1	600 psi Pressure Gauge	10-0130
16	1	Check Valve	SH 4600
17	1	Staffa HMB 080 Hydraulic Motor	87-0210B

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

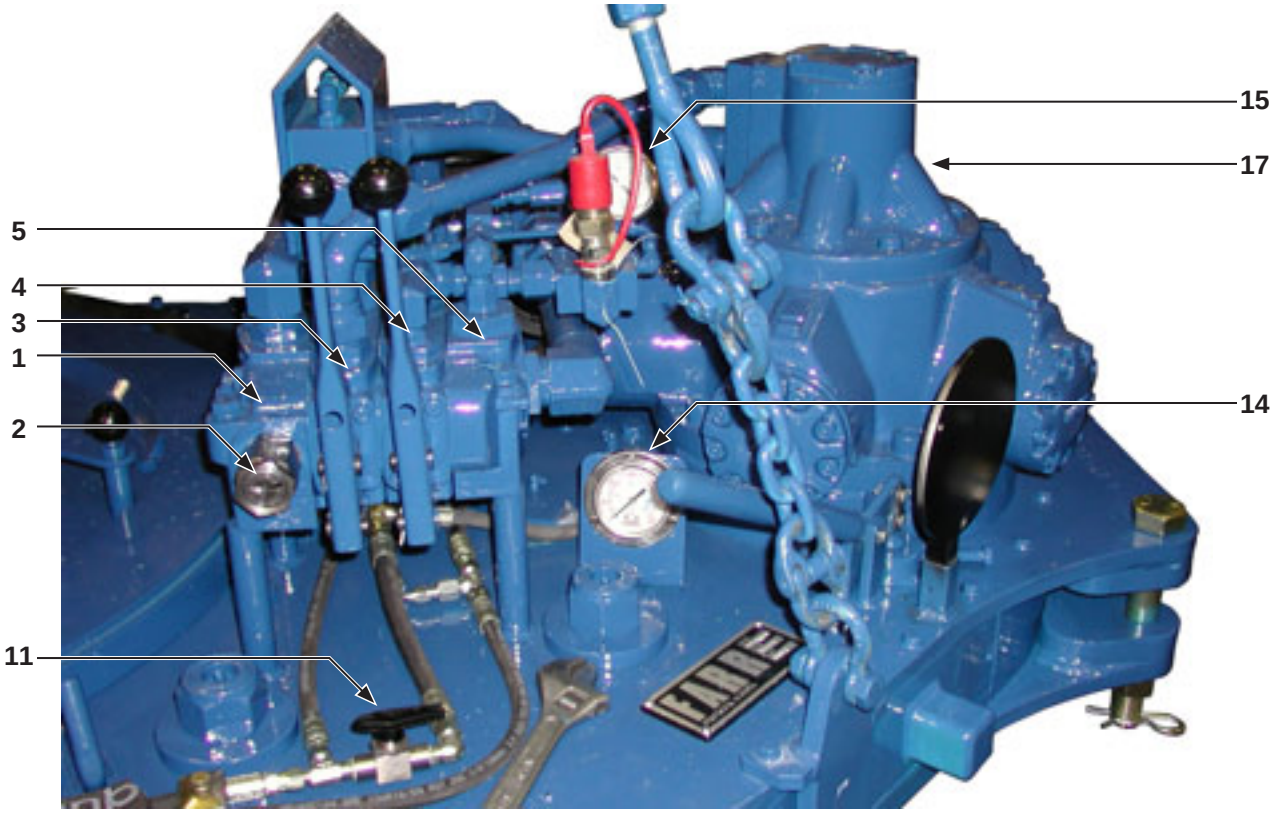


Illustration 2.C.2: Hydraulic Component Identification 01

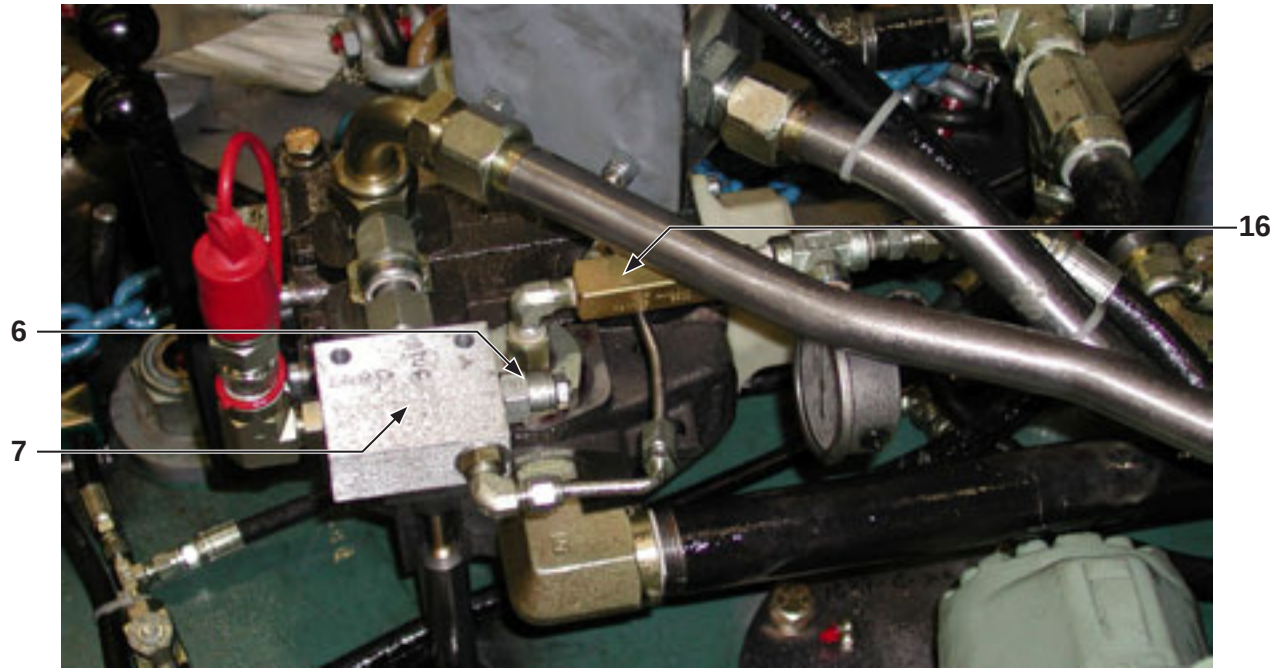


Illustration 2.C.3: Hydraulic Component Identification 02

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

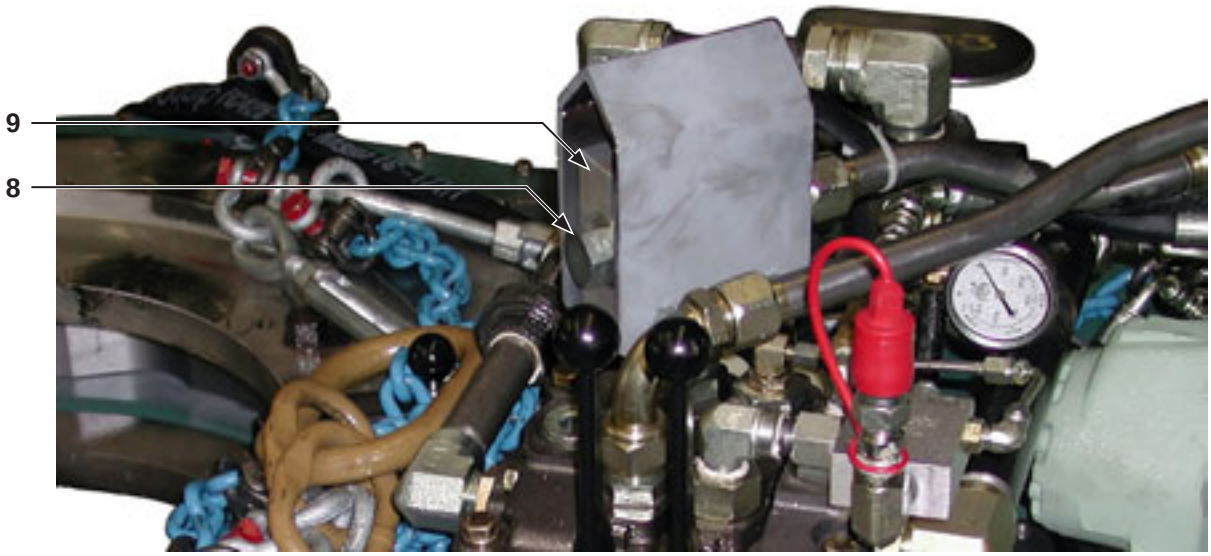


Illustration 2.C.4: Hydraulic Component Identification 03

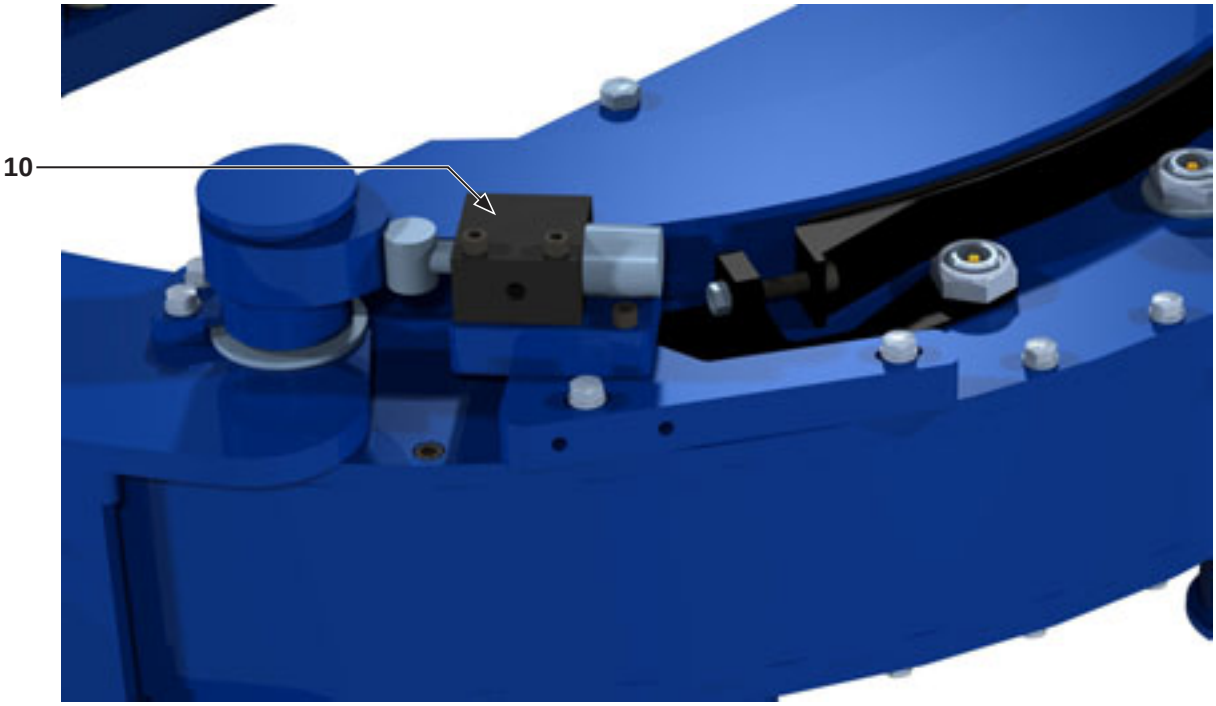


Illustration 2.C.5: Hydraulic Component Identification 04

MCCOY DRILLING & COMPLETIONS
MOVING GLOBAL ENERGY FORWARD
FARR

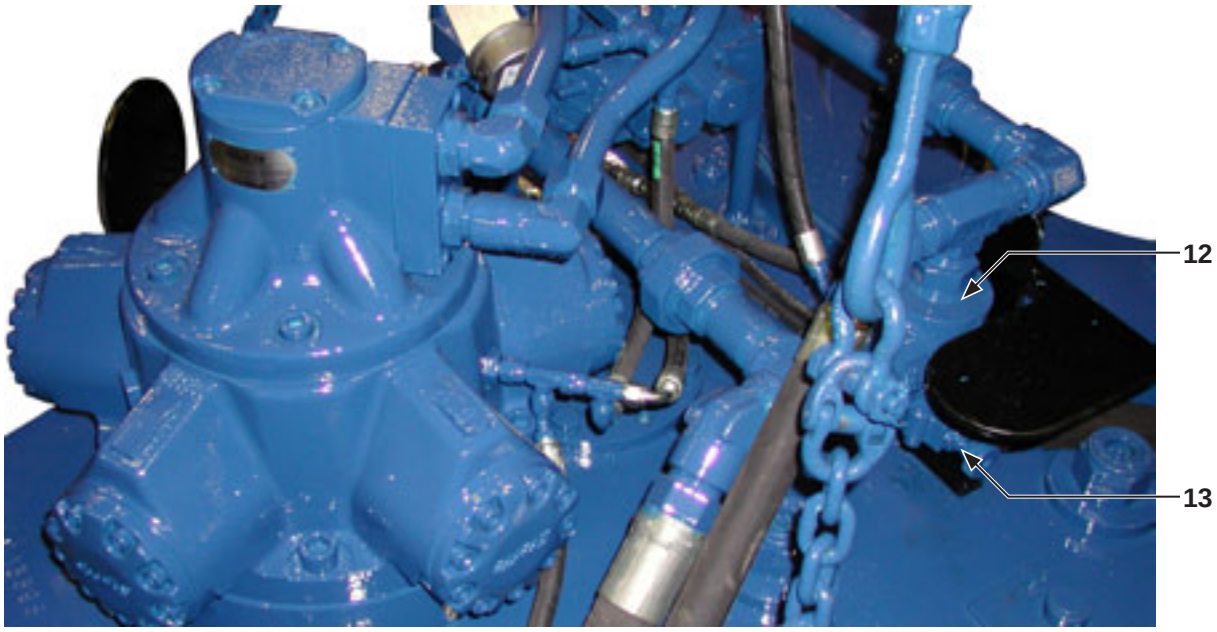


Illustration 2.C.6: Hydraulic Component Identification 05

D. HYDRAULIC CONNECTIONS

A pair of hydraulic lines - a 1-1/4" supply line and a 1" return line - connect the tong to the power unit (see illustration below). Ancillary devices (hydraulic motors, hydraulic cylinders, etc.) are connected through the valve block. Perform any hydraulic connection when the power unit is not running, or when the hydraulic pump is disengaged. The possibility of error in inter-changing the high pressure supply hose and the low pressure return hose has been eliminated, because the supply side coupling is smaller than the return side. These hose couplings are self-sealing, and care should be taken to ensure complete engagement to prevent partial closure of the check valve in the coupling. Ensure that the nut (female) side is completely made up onto the male connector - there is a line on the male fitting that indicates complete make-up. Snug the female fitting right up to the line.

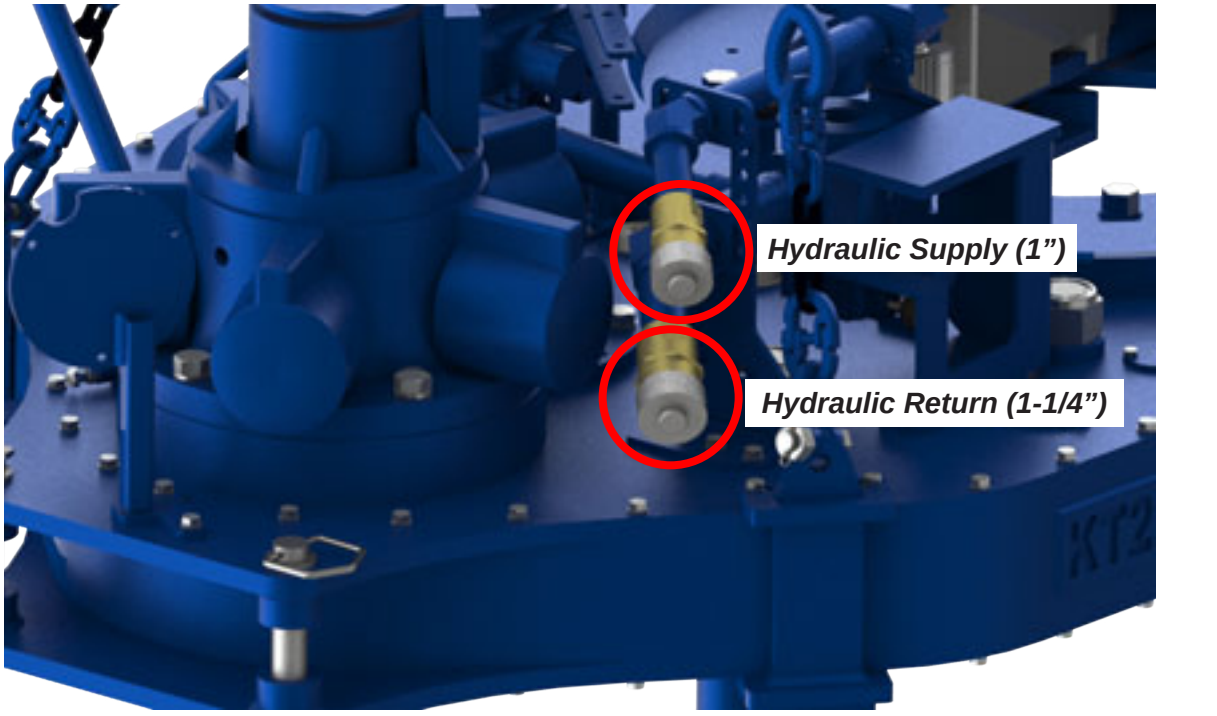


Illustration 2.D.1: Hydraulic Connections 01

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

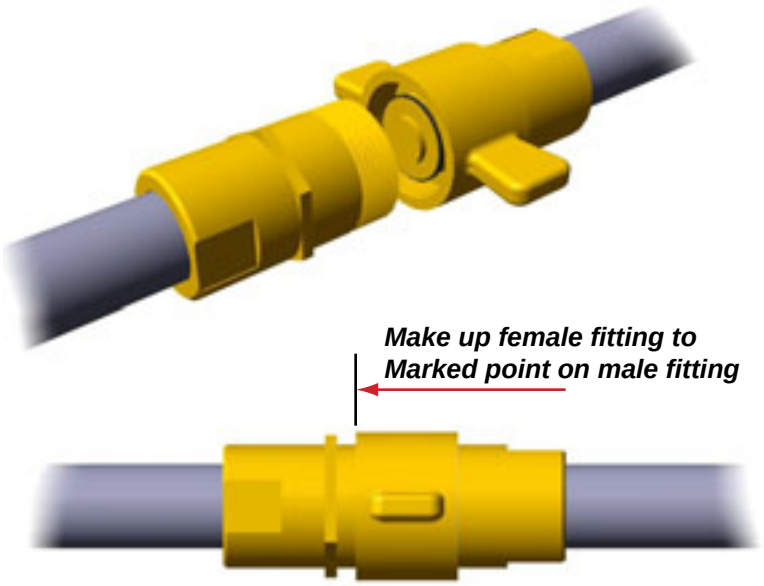


ILLUSTRATION 2.D.2: HYDRAULIC CONNECTIONS 02

E. TONG JAW AVAILABILITY AND INSTALLATION

1. Available Jaws

The following table lists all jaw die kits that are available as standard sizes for this model of tong. If your desired size is not listed, Farr can engineer custom jaw sizes - contact sales for further information.

Description	Part Number
8-5/8" Jaw Die Kit	1037-JDK-540-K
9-5/8" Jaw Die Kit	1037-JDK-545-K
9-7/8" Jaw Die Kit	1037-JDK-547-K
10" Jaw Die Kit	1037-JDK-546-K
10-3/4" Jaw Die Kit	1037-JDK-550-K
11-3/4" Jaw Die Kit	1037-JDK-555-K
11-7/8" Jaw Die Kit	1037-JDK-557-K
12-3/4" Jaw Die Kit	1037-JDK-556-K
13-3/8" Jaw Die Kit	1037-JDK-558-K
13-5/8" Jaw Die Kit	1037-JDK-560-K
14" Jaw Die Kit	1037-JDK-561-K
14-3/8" Jaw Die Kit	1037-JDK-564-K
15" Jaw Die Kit	1037-JDK-562-K
16" Jaw Die Kit	1037-JDK-565-K
17" Jaw Die Kit	1037-JDK-568-K
18" Jaw Die Kit	1037-JDK-569-K
18-5/8" Jaw Die Kit	1037-JDK-570-K
19" Jaw Die Kit	1037-JDK-574-K
20" Jaw Die Kit	1037-JDK-575-K
Standard 4" Replacement Die	12-1004

2. Jaw Removal & Die Replacement

- *Support tong jaw assembly.*
- *Remove the jaw pivot bolt.*
- *Slide the jaw towards the centre of the rotary assembly to free the jaw from the cageplates.*

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Jaw Removal & Die Replacement (Cont'd)

- *Remove the flanged retaining bolts to remove the dies - jaw dies may require light tapping with a hammer to free them from their slots.*

Reverse this procedure to install new jaw dies.

Note that if space allows, the entire jaw assembly does not need to be removed to replace the jaw dies.

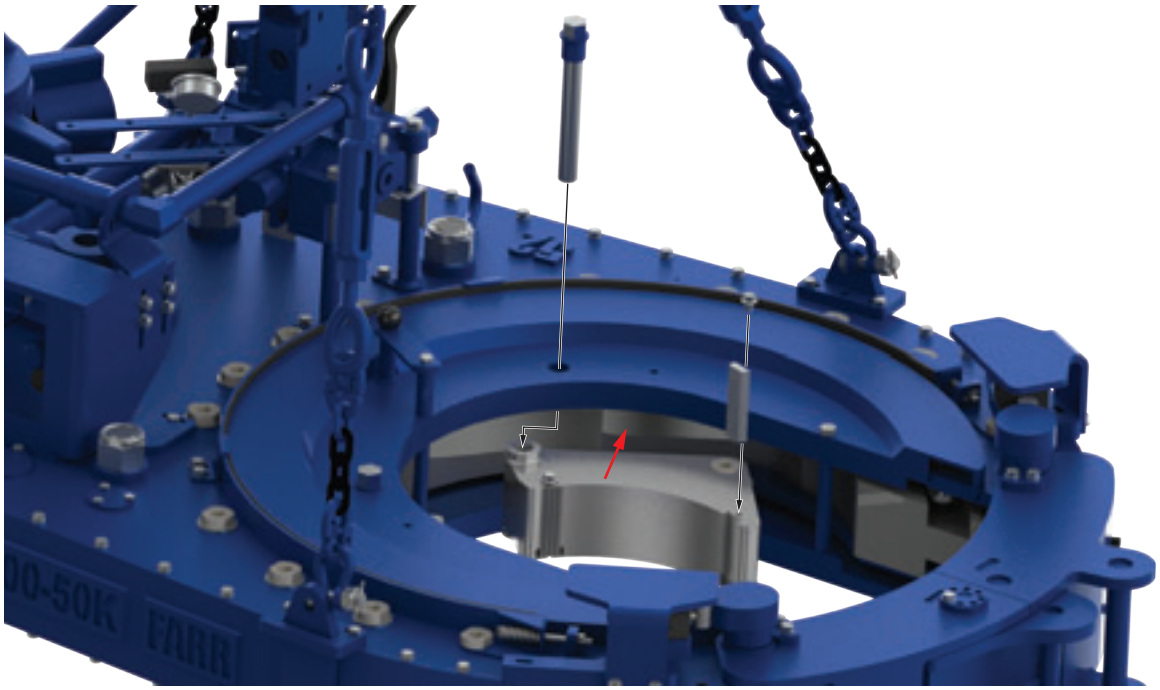


ILLUSTRATION 2.E.1: JAW REMOVAL

Once the jaw has been removed the jaw dies may be replaced by removing the keeper screw above the die, and tap the die from jaw using a hammer. Replace the die, tapping it into place if necessary, and replace the keeper screws.

F. TONG RIG-UP & LEVELING

1. Suspension & Restraint

Suspend the tong from a location as near to the centre of the drill rotary as possible, and from a location high enough on the mast to ensure easy handlng. The lower the point from which the tong is suspended, the more effort will be required to move the tong to and from the connection point.

The suspension line may be extended over a pulley and balanced by a counterweight equal to the weight of the tong, or simply tied off in the derrick to form a dead line. When using a dead line arrangement it is necessary to use a FARR spring hanger assembly (see specification page for recommended spring hanger). This spring hanger compensates for the downward movement of the casing as the thread is made-up, and imparts additional force to the suspension cable:

- *a "single spring" hanger typically applies 420 lbs. (191 kg.) to the suspension line for every inch of thread made up*
- *a "double spring" hanger typically applies 840 lbs. (382 kg.) to the suspension line for every inch of thread made up*

If you do not know which specific spring hanger is in use, check the specification page in this manual for information on the recommended spring hanger for this application. McCoy Drilling & Completions will not guarantee or specify spring hangers other than what has been supplied by McCoy.

Many applications use a lift cylinder for aadjusting the height of the tong. Ensure the weight of the lift cylinder is known if it has not been included in the total weight of the tong.

All forces upon the suspension line must be considered when calculating necessary strength of the suspension line. The weight of the tong, the weight of the lift cylinder, the weight of the spring hanger, and the force imparted on the suspension line by the spring hanger must all be added together in order to arrive at the total force supported by the suspension line. Select your suspension line based upon the total force and the margins of safety dictated by the policies of your company and by established engineering practices. Ultimately, calculating the force on the suspension line and selection of the suspension line is the complete responsibility of the customer.

McCoy Drilling & Completions recommends using dual backup (snub) lines of sufficient strength to withstand the force imparted by the maximum rated torque of the tong in use. Calculate the force on the snub lines by dividing the maximum torque of the tong by the tong's torque arm (expressed in feet). For example, an 50,000 lbs.-ft. tong with a 52 inch (4.333 ft.) torque arm will generate 11,540 lbs. of force against the snub line. Select your snub lines based upon the total force and the margins of safety dictated by the policies of your company and by established engineering practices. Ultimately, calculating the force on the snub line and selection of the snub line is the complete responsibility of the customer.

DRILLING & COMPLETIONS | FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Suspension & Restraint (Cont'd)

Snub lines must be securely connected to the rear of the tong, and tied off to a suitable anchor. One snub line must be secured to the load cell, which is then secured to the rear of the tong. The side of the tong the load cell connects to is dependant upon whether make-up or break-out activities are underway. To ensure accurate torque measurement, the torque measurement line must be connected perpendicular to the lengthwise axis of the tong, and perpendicular to the hang line (see illustrations 2.F.1 and 2.F.2). Connect the second snub line on the opposite side of the load cell, perpendicular to the lengthwise axis of the tong and perpendicular to the vertical.

MCCOY DRILLING & COMPLETIONS ACCEPTS NO RESPONSIBILITY FOR DESIGNING AND SELECTING AN ADEQUATE SUSPENSION AND RESTRAINT SYSTEM FOR YOUR DRILLING EQUIPMENT

ALL SELECTED FASTENERS, SHACKLES, CLAMPS, ETC. USED FOR CONSTRUCTING THE SUSPENSION AND SNUB LINES MUST BE RATED FOR THE CALCULATED FORCES.

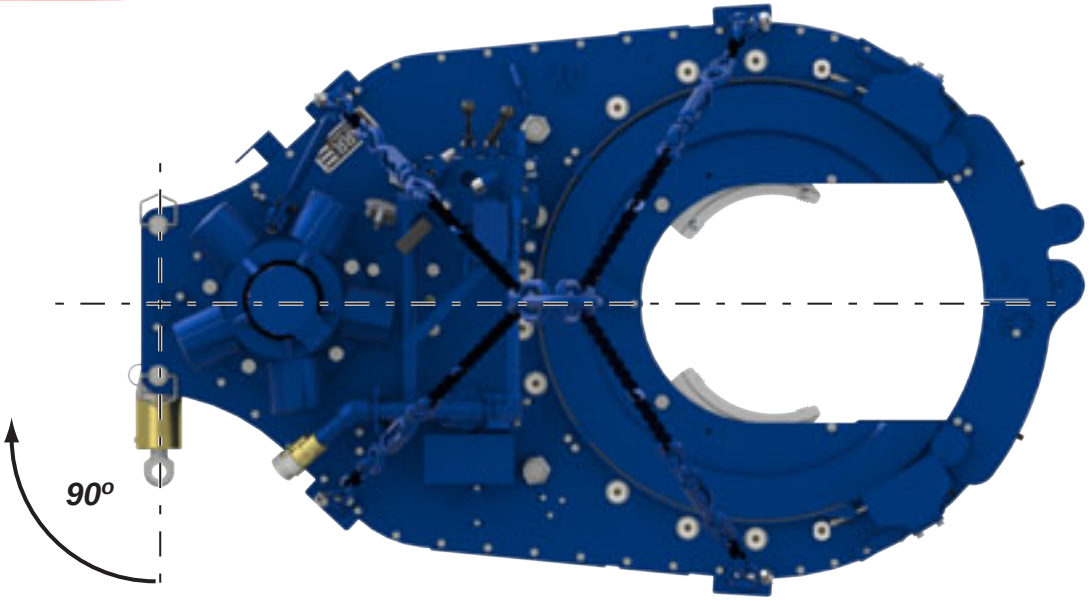


Illustration 2.F.1: Tong Suspension Relative To Axial Centre

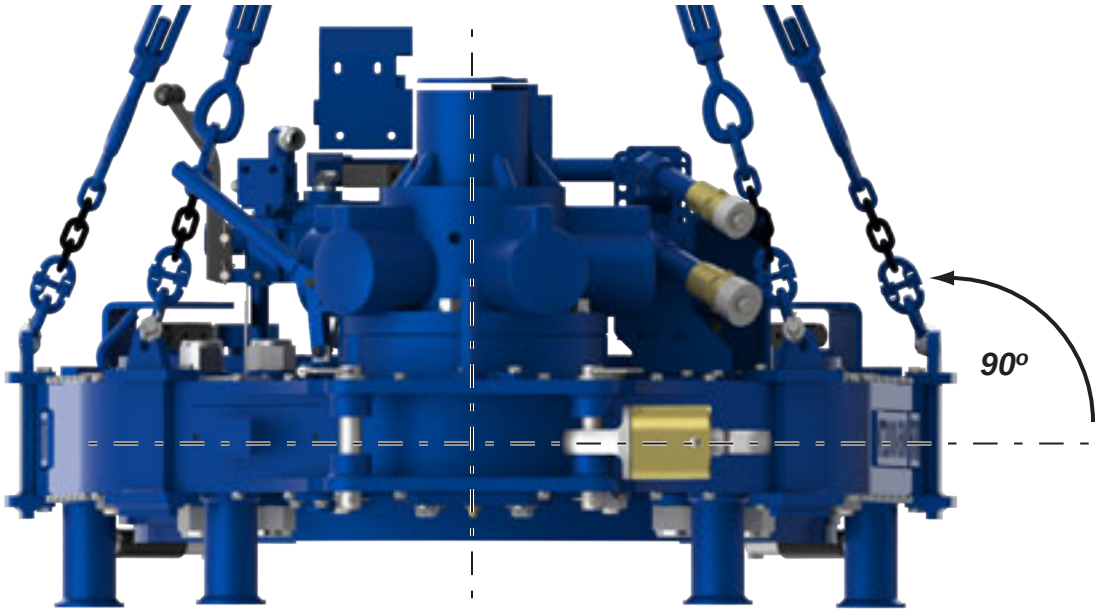


Illustration 2.F.2: Tong Suspension Relative To Vertical Centre

MCCOY DRILLING & COMPLETIONS
MOVING GLOBAL ENERGY FORWARD
FARR

2. *Tong Leveling*

The tong must be leveled side-to-side and front-to-rear before placing into service. The following guidelines wil assist you when leveling your tong.

i. Support the tong by the chain sling. Preset the positions of all four chains by rotating the turnbuckles on each chain hanger until the eye bolts are about half-way engaged in the turnbuckle. The turnbuckles can often be turned by hand; if this is not the case, use an adjustable wrench across the flats on the turnbuckle to turn it. Rotating the turnbuckles in one direction will cause the two eye bolts to extend away from the centre of the turnbuckle, while rotating them in the other direction will cause the eye bolts to retract toward the centre of the turnbuckle.

ii Place a level axially (side to side) across the tong, ensuring that it is parallel with the surface of the tong. Equally rotate the two turnbuckles on one or the other side of the tong until the level indicates the tong is parallel - for instance, if you decide to adjust the left side hangers to adjust the axial leveling, adjust the left side front and rear chains the same amount. If there seems to be a large adjustment to make, split the adjustment between the two sides - make half the adjustment using the two chains on one side, and the remaining adjustment using the two chains on the other side. If all four chains were pre-set, there should not be a large adjustment to make.

iii Place a level lengthwise (front to back) along the tong, ensuring that it is parallel with the surface of the tong. If the tong needs to be leveled front to rear, adjust both chains equally - either both rear chains or both front chains.

The leveling process may have to be repeated in order to optimize the adjustment of the hanger chains and ensure the tong is level.

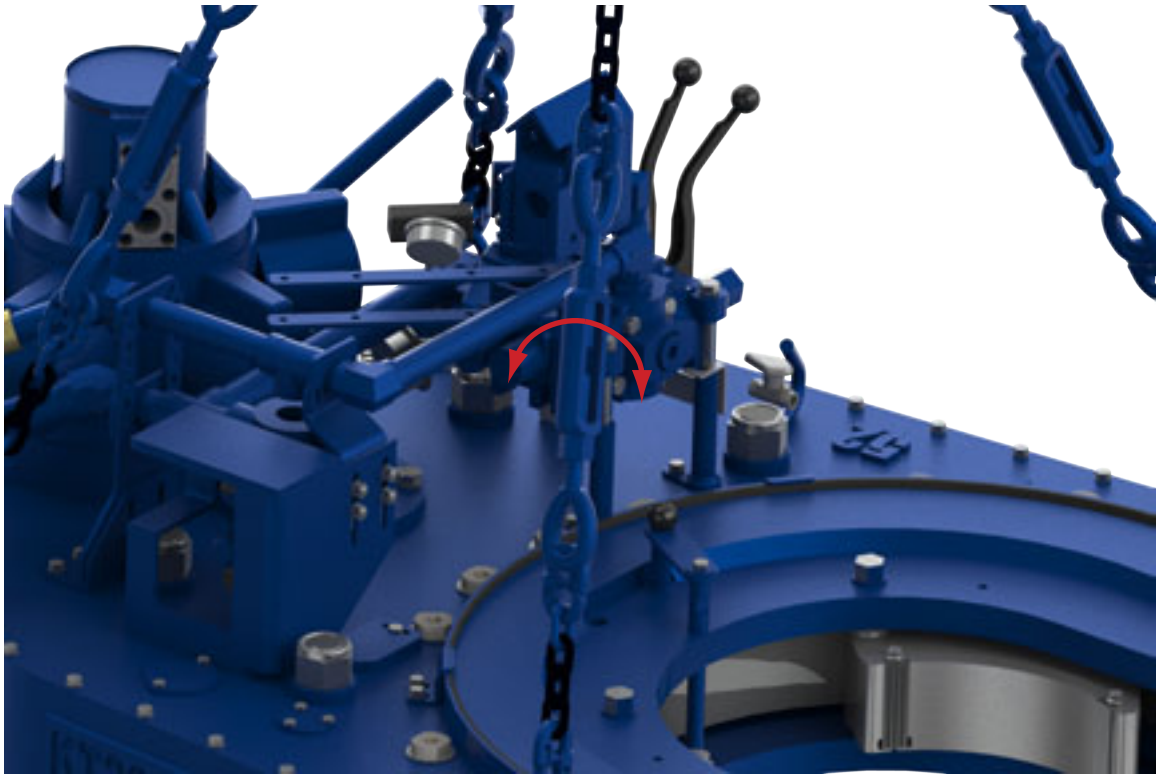


Illustration 2.F.3: Leveling Tong Using Turnbuckles

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

G. TONG OPERATION

1. Initial Start-up and Break-in Procedure

YOUR EQUIPMENT HAS BEEN THOROUGHLY TESTED AND INSPECTED AT THE FACTORY. HOWEVER, WE ADVISE INSPECTION AND TESTING OF YOUR NEW TONG AFTER TAKING POSESSION IN ORDER TO ELIMINATE THE POSSIBILITY OF SHIPPING DAMAGE.

McCoy Completions & Drilling recommends that the following pre-operating tests be performed after receipt from the factory or after extended storage, prior to releasing the tong to operations:

- *Perform a complete inspection of all fasteners to ensure none have loosened during transport.*
- *Connect the tong to the power unit, and apply full hydraulic pressure. Inspect and correct any leaks.*
- *Operate the tong at full speed and in high gear for a duration of one-half hour. Hot bearing caps may indicate impending bearing failure.*
- *Switch to low gear and operate for an additional one-half hour at full speed.*
- *Run the backup through several clamp/unclamp sequences to ensure functionality.*
- *Inspect all components and hydraulic fittings for possible defects following completion of the tests. All FARR Tongs have been throughly tested at the factory prior to shipping, but shipping damage must be identified before running the tong in an operational environment.*
- *Carefully inspect the safety door components, and test to ensure that the safety device on each door is operating correctly before releasing the tong to the operating environment.*

TONG DOOR MUST BE CLOSED AND SECURELY LATCHED BEFORE THE POWER UNIT IS STARTED IN ORDER TO ASSURE THE SAFETY OF OPERATING PERSONNEL

Ensure adequate lube oil and hydraulic oil levels before starting engine. Use start up procedures as recommended by the power unit engine operator's manual. Open the Bypass Valve on the hydraulic system, and inspect all pressure and return line hose connections to ensure correct and secure installation.

IMPROPERLY SECURED HYDRAULIC CONNECTIONS WILL INTERRUPT HYDRAULIC FLUID FLOW, AND COULD RESULT IN THE FOLLOWING FAILURES:

- *A restriction in the pressure supply hose will result in high pressure within the power unit hydraulic system, which will activate the hydraulic governor and increase the engine speed to as high as maximum RPM.*
- *A restriction in the return line will result in high pressure within the power unit and the tong hydraulic system, causing engine speeds as high as maximum RPM, and possible failure of the motor seal.*

Following inspection of the hoses, start the engine and allow it to idle until warm. Allow hydraulic fluid to circulate for approximately 10 minutes, then slowly close the Bypass Valve to allow hydraulic fluid to circulate through the hoses and to the tong (circulating pressure should not exceed 200 psi). Place the tong gear shifter in low gear and rotate the tong slowly forward and then reverse with the throttle valve control lever. Once this has been done and the proper size jaws have been installed, the tong is then ready to run pipe.

2. VALVE OPERATION

4-way proportional valves control operation of hydraulic devices on the tong assembly such as hydraulic motors and cylinders. When any one valve is "centered" or in the detent position, there is no hydraulic output from the valve. When the valve is pushed forward there is an effect, and when the valve is pulled back, there is an opposite effect. These valves feature proportional control, which means that further extension of the valve handle (thereby further opening the valve orifice) results in proportionally higher hydraulic output to the controlled device.

The following illustration demonstrates the type and effect of the hydraulic valves with which this tong is may be equipped.

DRILLING & COMPLETIONS | FARR
MCCOY MOVING GLOBAL ENERGY FORWARD

TONG MOTOR

This is a proportional valve. Pushing the valve handle forward will cause the tong motor to rotate in a clockwise direction (as seen from the top of the tong). This is the desired direction of rotation for making up a joint. Pulling the valve handle in the opposite direction results in counter-clockwise rotation, which is the desired direction of rotation for breaking out a joint.

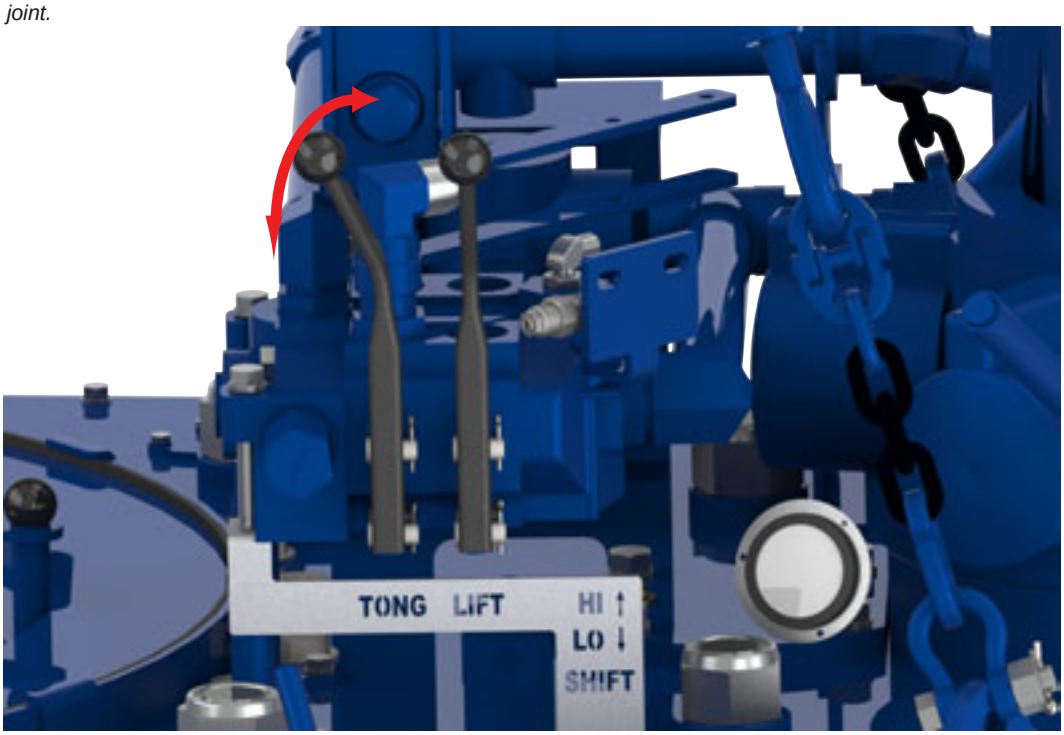


ILLUSTRATION 2.G.1: TONG ROTATION (MOTOR) CONTROL

LIFT CYLINDER

This is a proportional valve. Pushing the valve handle forward will cause the lift cylinder to lift the tong vertically. Pulling the valve handle in the opposite direction will cause the lift cylinder to lower the tong.

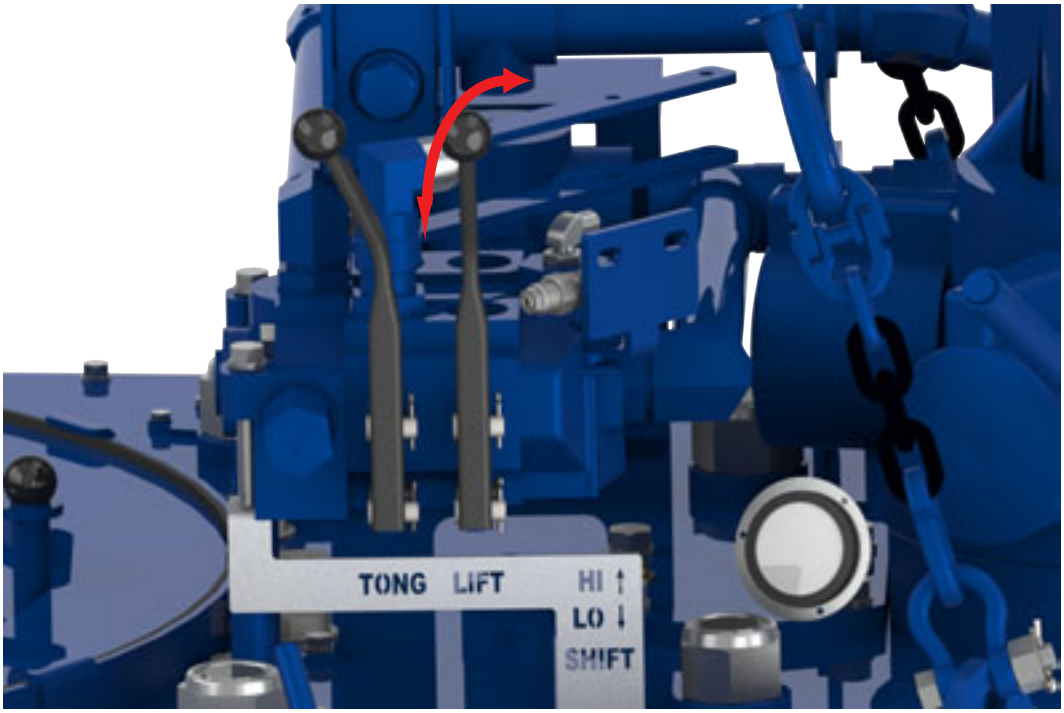


ILLUSTRATION 2.G.2: TONG LIFT CYLINDER CONTROL

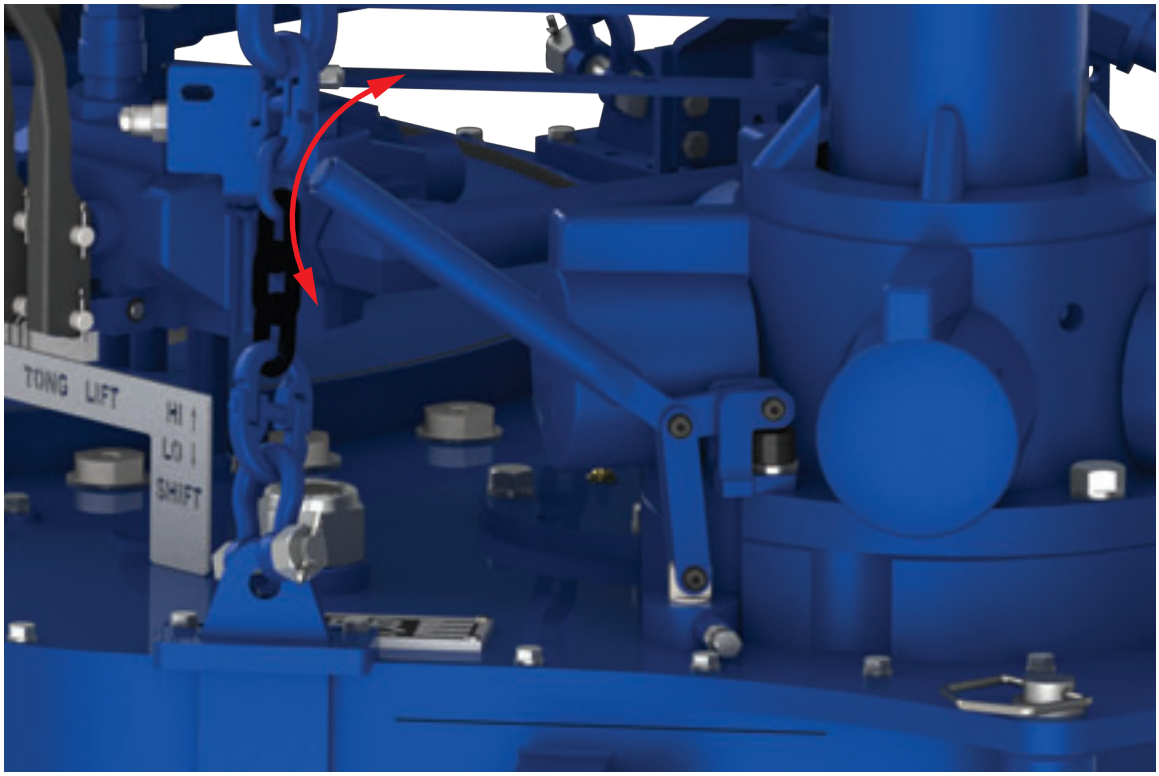
DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

3. SHIFTING GEARS

The shifting shaft has three "detent" positions identifying the low speed/high torque position, the "neutral" or free-spinning position, and the high speed/low torque position. The detent strength may be adjusted by releasing the locknut on the detent tube and increasing or relaxing pressure on the detent spring. Ensure the locknut is tightened once the desired detent pressure has been set.

To shift to the high-speed gear, move the shifting handle upward from neutral position. To shift to the low-speed gear, move the shifting handle down through the neutral detent to its lowest position. Note that the high clutch gear or the low clutch gear may not be exactly aligned when shifting, so the operator may need to "bump" the motor control handle slightly to turn the main clutch gear shaft and shifting collar into alignment. This is most effective when applying a small amount of pressure on the gear shift lever in the direction you want to shift the tong, ensuring the shifting collar will "catch" when the main clutch gear aligns with either the high or low clutch gear (see Illustration 2.G.4 next page).

SHIFTING TONG WHILE ROTATING THE MOTOR AND CAGEPLATE MAY RESULT IN CATASTROPHIC GEARTRAIN FAILURE



4. GENERAL COMMENTS

a) *Position rotary gear in contact with both idler gears when breaking out joints or collars where high torques are required.*

b) *When making-up integral (shouldered) joints, it is essential to make up the last turn of the threads in low gear. This reduces the tendency of an instant stop or a sudden increase in torque, which induces extremely high stresses on the gear train.*

c) *DO NOT employ the "snap break" method of breaking-out joints when pulling a string. By definition, the "snap break" method is a procedure used by some operators to break out connections, accomplished by leaving slack in the "jaw-pipe" engagement, and then quickly pulling the throttle valve control lever allowing the tong to snap into its loaded or high torque condition. Although this method is very effective in breaking out joints, the extremely high stress placed on the gear train frequently causes gear breakage.*

THE "SNAP-BREAK" METHOD IS HAZARDOUS TO RIG PERSONNEL AND EQUIPMENT

DRILLING & COMPLETIONS
MCCOY
MOVING GLOBAL ENERGY FORWARD
FARR

H. MAKING AND BREAKING CONNECTIONS

THESE OPERATING PROCEDURES ASSUME THE USER HAS PROPERLY SET UP AND PREPARED THE EQUIPMENT FOR OPERATION AS PER SECTIONS 2D, 2E, AND 2F OF THIS MANUAL.

Set up and prepare your equipment for operation as per Section 2 of this manual Refer to the following sections:

- *2.D - Hydraulic Connections*
- *2.E - Tong Jaw Installation*
- *2.F.1 - Tong Rig-up and Leveling (Suspension)*
- *2.F.2 - Tong Rig-up and Leveling (Leveling)*

Your tong and backup assembly should be properly suspended, connected to a hydraulic power source, and ready to make or break connections at this point.

1. Making A Connection

a) *Ensure hydraulic power supply to the tong is energized. The master link on the rigid sling must be used to suspend the tong. Do not suspend the tong from any other point.*

ILLUSTRATION 2.H.1: MASTER LIFTING LINK

THE MASTER LINK MUST BE USED TO SUSPEND THE TONG ASSEMBLY

b) *Ensure the backing pin is in the "makeup" position. From the front of the tong, the backing pin correctly configured for makeup will be in the 10 o'clock position (see Illustration 2.H.2 next page). If it is not, simply lift up and place in the correct position (see Illustration 2 next page). The cageplate opening must be aligned with the door opening when setting the backing pin position.*

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Making A Connection (Continued)

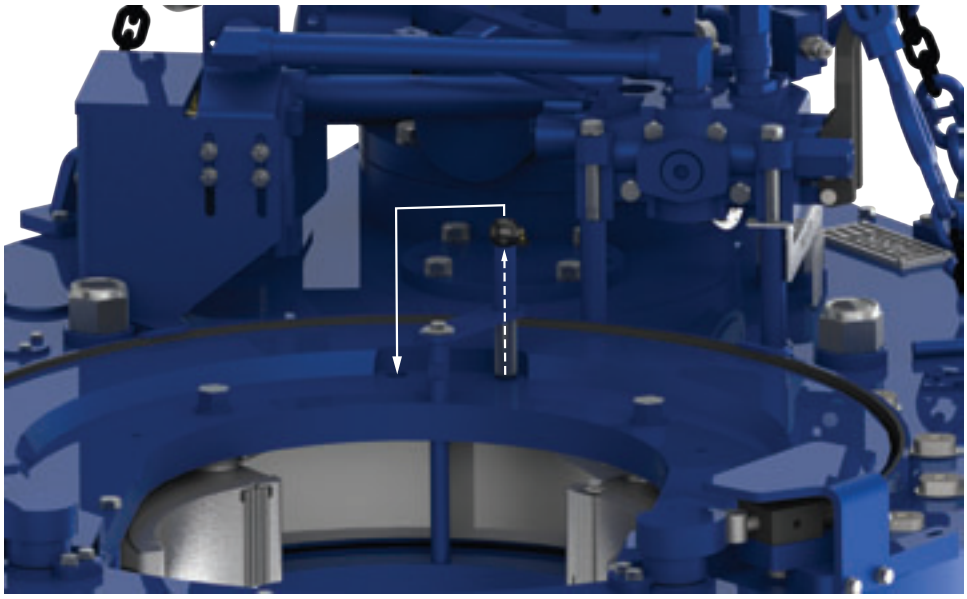


Illustration 2.H.2: Setting Backing Pin To "Make-up" Position

c) *Ensure the load cell and snub line(s) are properly configured for making up connections. The "snub line" is a length of wire rope that connects the rear of the tong body to a sturdy anchor on the drill floor (see Section 2.F.1). The snub line prevents the tong body from spinning in the opposite direction of the cageplate when torque begins to build in the joint. The snub line must be rated for the applied torque plus whatever safety margins stated by your own operating policies. The snub line connection point on the drill floor must be sturdy enough to absorb all applied forces when making up the joints. When making up joints the snub line is attached to the driller's side of the tong, which is the left side of the tong as seen from the rear. For accurate torque measurement the snub line must be perpendicular to the vertical, and perpendicular to the centre-line of the tong.*

d) *Actuate the lift cylinder control valve to lift the assembly from the drill floor. Pushing the valve toward the center of the tong will retract the lift cylinder to lift the assembly (see Illustration 2.H.3 below). Note that rig personnel are required to stabilize the tong and backup as it is being lifted so it does not swing and collide with other rig equipment.*

RIG PERSONNEL MUST STABILIZE THE TONG AS IT IS LIFTED FROM THE DRILL FLOOR

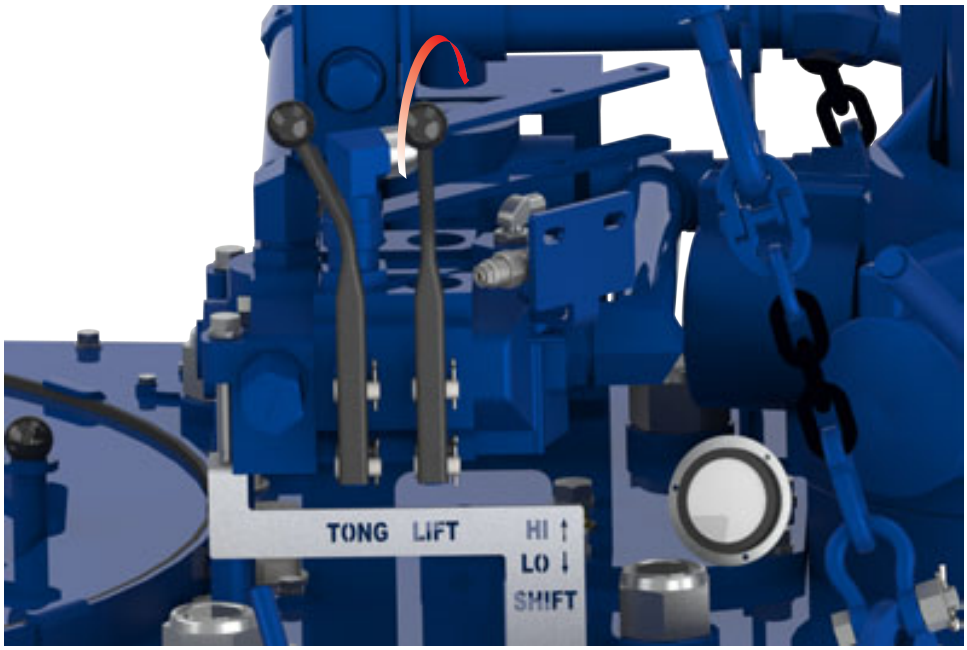


Illustration 2.H.3: Lift Cylinder Control - Raise

DRILLING & COMPLETIONS | FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Making A Connection (Continued)

e) Grasp the tong door latch and pull to open the RH door. After the latch-side (RH) door is open grasp the handle on the LH door and swing open. Since your equipment is equipped with safety doors, opening the door will inhibit rotation of the cageplate.

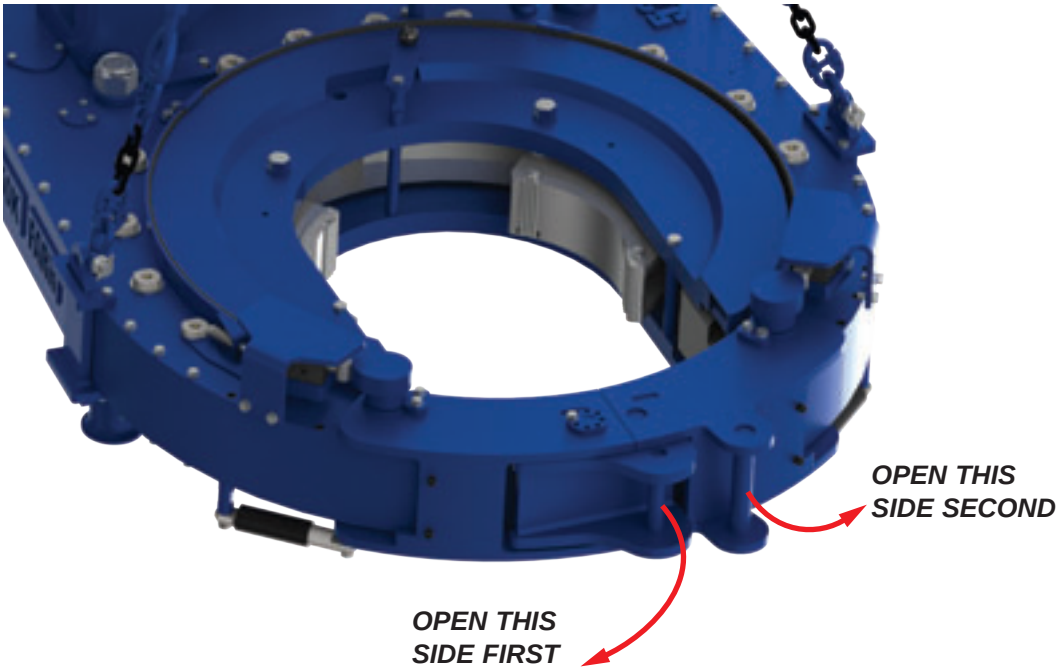


ILLUSTRATION 2.H.4: OPENING TONG DOORS

f) Manually engage the threads of the tubing connection being made up. Ensure threads are not cross-threaded.

g) Move the tong on to the tubing joint. Use the lift cylinder to ensure the tong jaws are at the correct location above the connection joint.

h) Firmly close the LH tong door, followed by the RH tong door. Tug firmly on the LH door handle to ensure the latch is firmly engaged.

i) Ensure tubing is roughly centered within the tong jaws - rig personnel are required to stabilize the tong above the connection until the jaws have been cammed on to the pipe or casing.

j) Begin rotation with the tong in high gear (high speed/low torque). See Section G.3 to properly set the tong to high gear. Do not shift gears while the tong is rotating.

SHIFTING TONG WHILE ROTATING THE MOTOR AND CAGEPLATE MAY RESULT IN CATASTROPHIC GEARTRAIN FAILURE

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Making A Connection (Continued)

k) Push the motor control valve toward the tong to rotate the cageplate in the make-up direction.

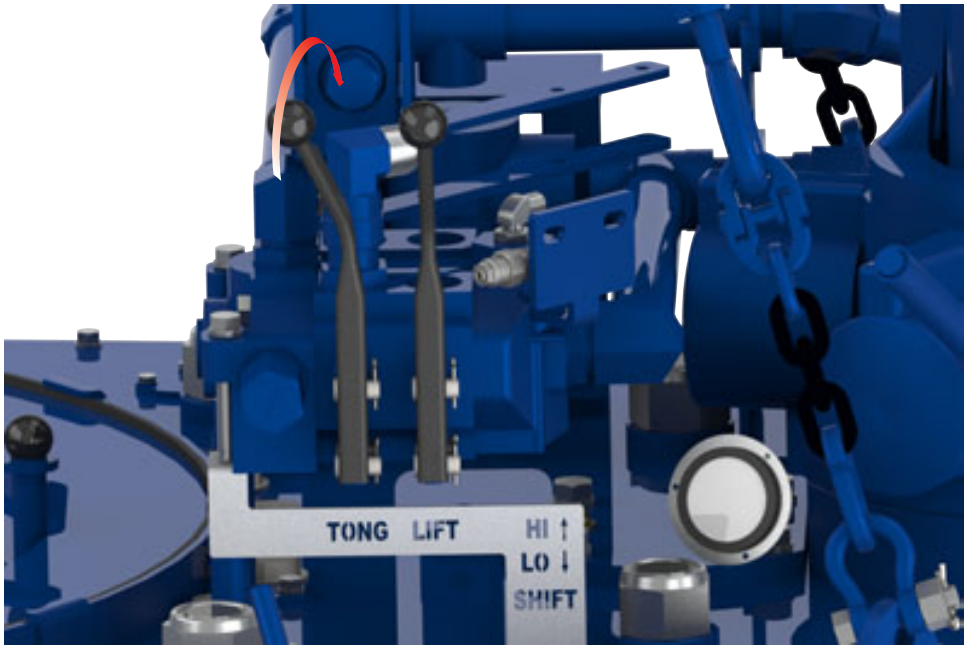


ILLUSTRATION 2.H.5: MOTOR CONTROL - MAKE-UP

l) When the tong jaws cam on to the tubing push the rotation control handle all the way in to thread the connection together at high speed. As the joint becomes fully made up the increasing torque demand will stall the motor, and displayed torque will increase.

m) Stop rotation, and set motor to low speed and shift to low gear (low speed/high torque). See Section 2.G.3 for instructions for shifting to low gear. This will enable the tong to produce adequate torque for making up the joint to specification.

n) Push the rotation control handle all the way in to complete the connection at low speed/high torque. Observe the torque gauge - when the specified make-up torque is reached stop rotation. Reverse the rotation control valve to release the tong jaws from the tubing (see Illustration 2.H.6).

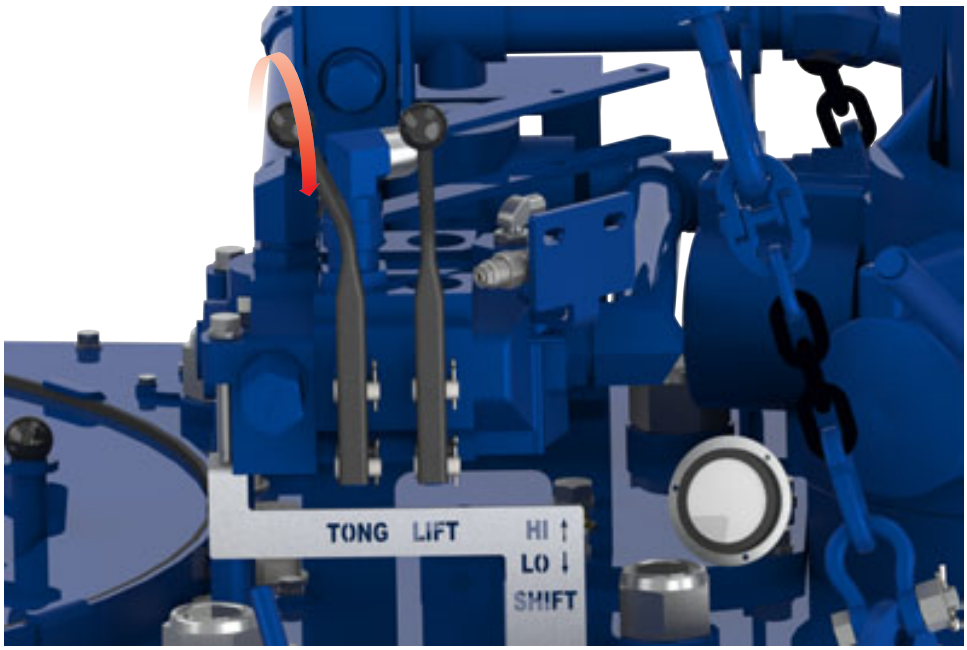


ILLUSTRATION 2.H.6: MOTOR CONTROL - RELEASING JAWS

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Making A Connection (Continued)

o) When tong jaws are free, align the opening in the rotary gear with the mouth of the tong, and open the tong doors to free the tong from the drill string. Note that rig personnel may be required to stabilize the tong as it completely releases from the drill string. Guide the tong away from the string and use the lift cylinder control to lower it to the drill floor if desired.

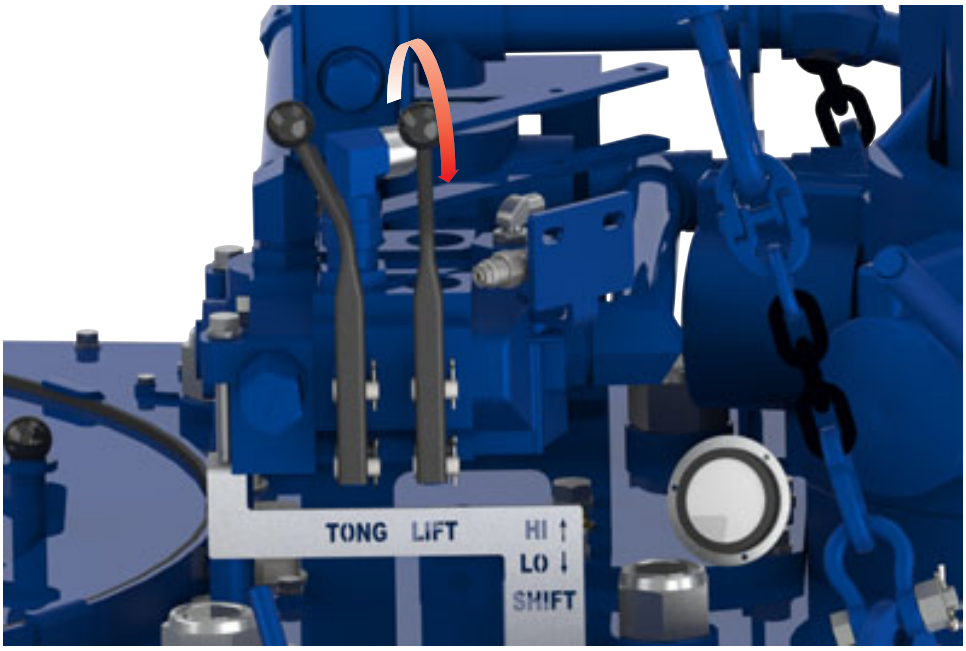


Illustration 2.H.7: Lift Cylinder Control - Lower

p) Repeat steps "f" through "o" until the desired number of connections are made up.

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

2. Breaking A Connection

YOUR TONG SHOULD BE PROPERLY SUSPENDED, CONNECTED TO A HYDRAULIC POWER SOURCE, AND READY TO BREAK CONNECTIONS.

a) *Ensure hydraulic power supply to the tong and backup is energized. The master link on the rigid sling must be used to suspend the tong. Do not suspend the tong from any other point. See Illustration 2.H.1.*

b) *Set the backing pin for "breakout" operation. Lift up on the backing pin and rotate it to the "breakout" position, which is 2 o'clock as seen from the front of the tong. The opening in the rotary gear must be aligned with the tong door opening in order to properly set the backing pin (see Illustration 2.H.8).*

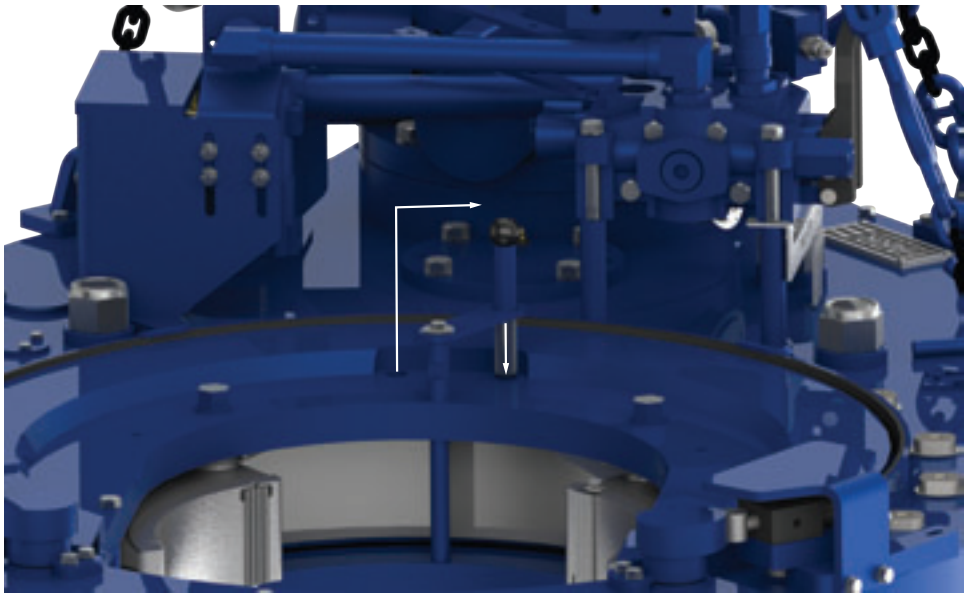


Illustration 2.H.8: Setting Backing Pin To "Break-Out" Position

c) *Ensure the load cell and snub line are configured for break-out operation. The load cell must be transferred to the off-driller's side (the right hand side as seen from the rear of the tong), and the snub line must be transferred to the driller's side to perform break-out operations.*

d) *Open the tong doors (see Illustration 2.H.4).*

e) *Actuate the lift cylinder control valve to lift the assembly from the drill floor if necessary. Pushing the valve toward the center of the tong will retract the lift cylinder to lift the assembly (see illustration 2.H.3). Note that rig personnel are required to stabilize the tong and backup as it is being lifted so it does not swing and collide with other rig equipment.*

RIG PERSONNEL MUST STABILIZE THE TONG AS IT IS LIFTED FROM THE DRILL FLOOR

f) *Move the tong on to the tubing joint. Use the lift cylinder to ensure the tong jaws are at the correct location above the connection joint.*

g) *Firmly close the tong door against the latch post.*

h) *Ensure tubing is roughly centered within the tong jaws - rig personnel are required to stabilize the tong above the connection until the jaws have been cammed on to the pipe or casing.*

i) *Breakout torque is only available when tong is in low gear. See Section 2.G.3 for instructions on shifting your tong to low gear. Do not shift gears while the tong is rotating.*

SHIFTING TONG WHILE ROTATING THE MOTOR AND CAGEPLATE MAY RESULT IN CATASTROPHIC GEARTRAIN FAILURE

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Breaking A Connection (Continued)

j) Pull the motor control valve toward the operator to rotate the cageplate in the break-out direction.

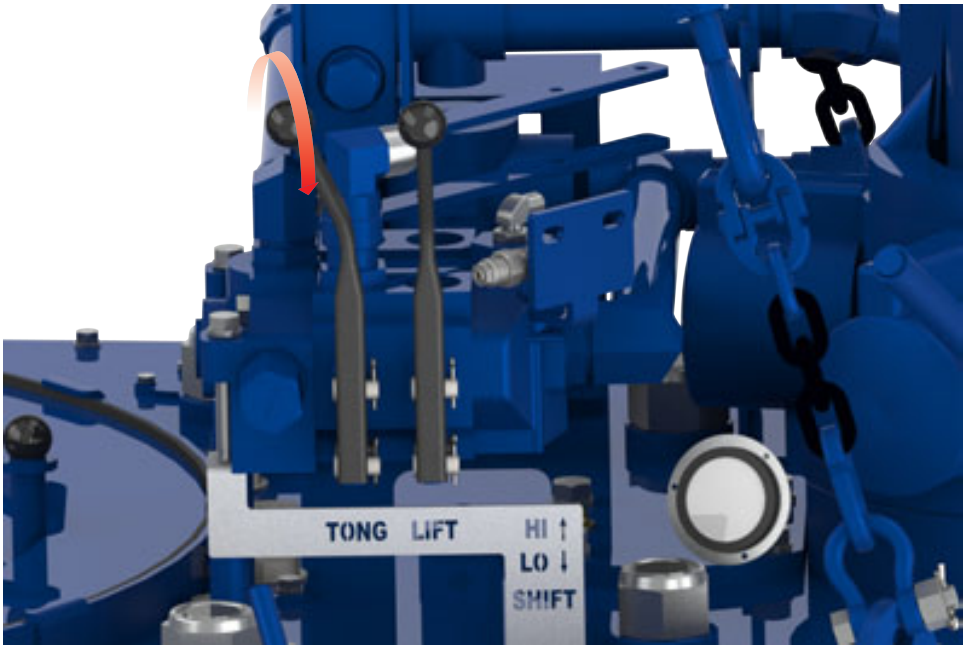


Illustration 2.H.9: Rotation Control - Break-Out

l) When the tong jaws cam on to the tubing pull the rotation control handle all the way out to break the connection.

m) When the connection breaks stop rotation and shift to high gear (see Section 2.G.3 to shift to high gear). This will enable the tong to completely unthread the connection at high speed.

n) Pull the rotation control handle all the way out to completely unthread the connection. Reverse the rotation control handle (push toward tong) to release the tong jaws from the tubing (see Illustration 2.H.10).

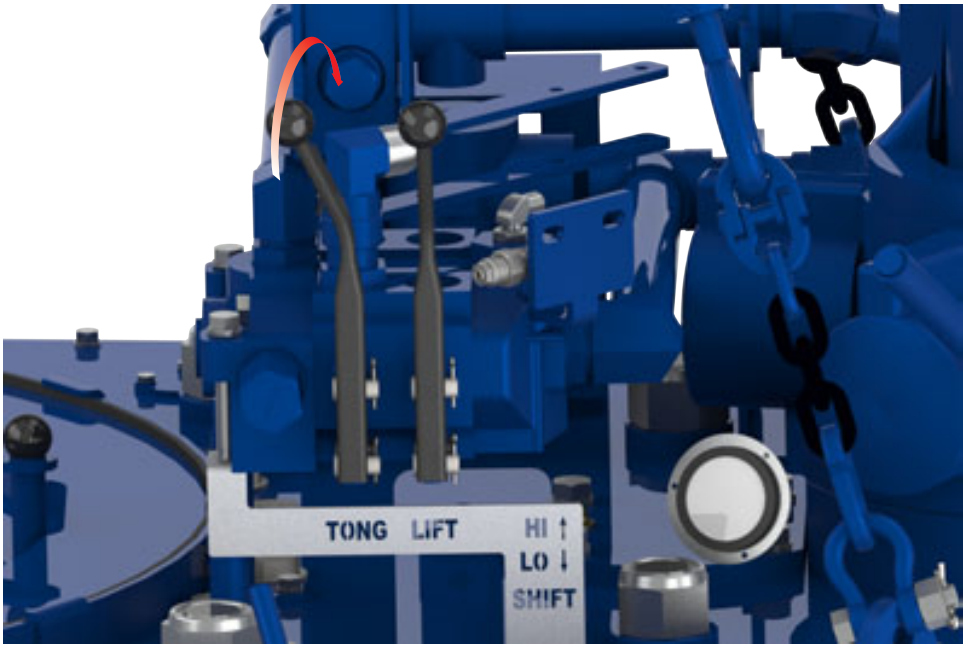


Illustration 2.H.10: Releasing Tong Jaws Following Break-out & Unthreading

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Breaking A Connection (Continued)

o) When the tong jaws disengage align the opening in the rotary gear with the mouth of the tong, and open the tong door to free the tong from the drill string. Unlatch and open the tong door to free the assembly from the tubing. Note that rig personnel may be required to stabilize the equipment as it completely releases from the tubing. Guide the assembly away from the string and use the lift cylinder control to lower it to the drill floor if desired.

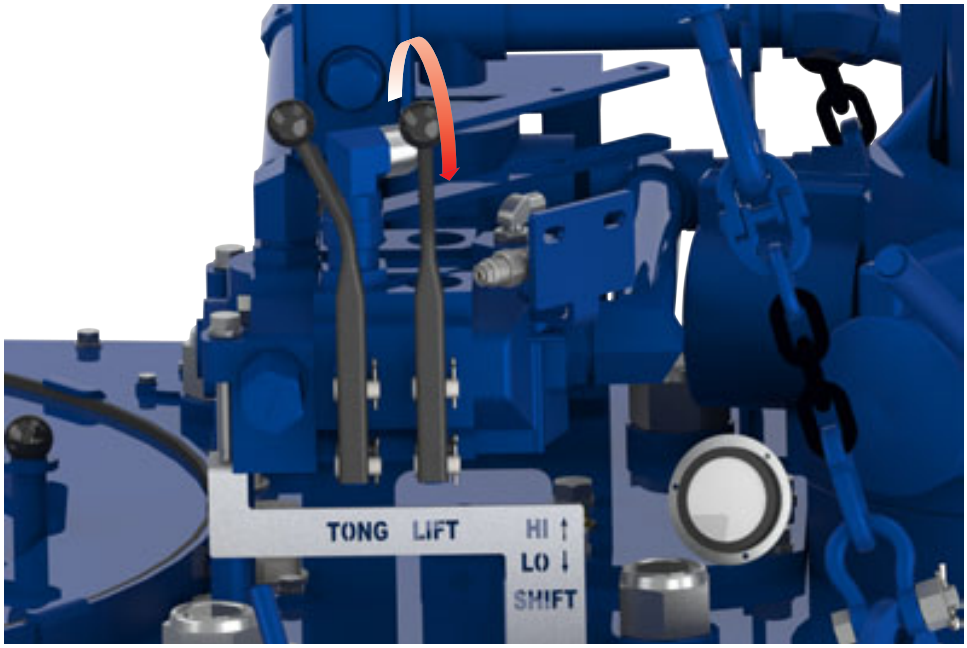


ILLUSTRATION 2.H.11: LOWERING TONG USING LIFT CYLINDER CONTROL

p) Use your rig's standard pipe handling procedures to remove and rack the freed tubing stand.

q) Repeat steps "e" through "p" as many times as necessary to break out and unthread the desired number of connections.

H. EXTREME COLD WEATHER OPERATION PROCEDURES

1) Consult the power unit engine operator's manual for all cold weather operating procedures and precautions.

2) Select gear and bearing lubricants that are compatible with expected climatic conditions.

3) Select hydraulic fluid that is compatible with expected climatic conditions.

4) Allow hydraulic fluid to circulate for approximately 20 minutes after starting the power unit, prior to activating the bypass valve to allow fluid to circulate to tong. If the power unit is equipped with an oil temperature gauge, ensure that the fluid has reached operating temperature as specified by hydraulic fluid data sheet.

5) Allow for adequate drying of moisture (prior to lubricating) when cleaning tong parts in cold weather.

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

This page intentionally left blank

McCoy Completions & Drilling recognizes that minor on-site repairs and modifications are required to maintain peak operating condition of your equipment, or to match your equipment with the operating environment. Examples of minor repairs are

- *replacement of damaged hydraulic hoses and fittings.*
- *replacement of malfunctioning pressure gauges and valves.*
- *replacement of door cylinders*
- *replacement of fasteners*

Any replaced component must be an identical component supplied by McCoy Completions & Drilling. Replaced fasteners must be Grade 8 or equivalent, or whatever fastener is specified by McCoy.

A. GENERAL MAINTENANCE SAFETY PRACTICES

The practices identified here are intended as a guideline. All personnel are responsible for performing their tasks in a manner that ensures worker, equipment, and environmental safety, and may require taking additional steps that are not identified in this section.

Equipment maintenance shall be performed only by designated qualified maintenance personnel. Wear approved eyewear and footwear, and follow all of your company's safety guidelines Do not begin a maintenance task without the proper tools or materials on hand, or the proper drawings and documentation necessary.

Schedule planned maintenance with operators to avoid conflicts, unnecessary downtime, and the danger of accidental equipment activation. Notify operations when maintenance procedures are complete and equipment functionality is restored.

Isolate the location of the maintenance under way to prevent unaware personnel from inadvertently exposing themselves to a hazard. Use tape, rope, or signage to clearly indicate "off-limits" area.

Replacement of large, heavy individual parts and/or heavy structural components must be performed using an approved lifting device of sufficient lifting capacity. Use care when attaching the lifting device, and safeguard area to avoid endangering personnel or equipment.

All spare parts must meet or exceed OEM specifications in order to maintain equipment integrity, especially protective equipment

McCoy recommends that disconnection of hydraulic connectors be performed with the power unit off and the hydraulic circuit depressurized.

Your equipment uses materials that may be harmful to the environment if improperly disposed of (hydraulic fluid, grease, etc.). Dispose of all materials according to your company's proscribed environmental protection regulations.

B. CLEANING

Clean tong thoroughly cleaned with a good petroleum-based cleaning agent after each job, prior to storage. Farr recommends that the motor and valve assembly be periodically removed, along with the top tong plate, so that guides, rollers and gears can be properly cleaned. Ensure that cleaning solvents and chemicals are captured to prevent environmental contamination, and dispose of all materials according to your company's proscribed environmental protection regulations.

C. PREVENTIVE MAINTENANCE

Regular maintenance programs are necessary, and must be established to assure safe, dependable operation of your Hydraulic Tubular Connection Systemm and to avoid costly breakdown maintenance.The following maintenance procedures provides information required to properly maintain your equipment. Your equipment may require more, or less maintenance depending upon the frequency of use and the field conditions under which your equipment operates. These maintenance procedures are designed for equipment operating at 10°C to 35°C ambient temperature for 10 hours per day. McCoy recommends that the inspection and maintenance procedures in this section be performed as recommended in the maintenance checklists (see Appendices), or in conjunction with your maintenance foreman's experience and best estimate of when your equipment is due for this maintenance.

Purchased components included with your hydraulic tubular connection equipment (for example: motors, valves, etc.) may specify maintenance tasks and intervals over and above what McCoy recommends as part of their recommended procedures. Users of this equipment may choose to perform or ignore these additional tasks at their discretion.

Premature fouling of particulate filters within your prime mover or ancillary hydraulic power unit requires immediate hydraulic fluid laboratory analysis to prevent premature wear of hydraulic system due to high levels of wear metals in the fluid.

McCoy Completions & Drilling recommends tracking all maintenance activity including the lubrication schedule. This may be a simple as keeping a paper log, or using a software-based maintenance tracking utility. A maintenance log is a valuable tool that can be used for easily retrieving maintenance history or identifying trends that require correction.

D. LUBRICATION

Use a quality multipurpose bearing lubricant that will remain within its viscosity range at expected operating temperatures. In addition, Farr recommends the following lubrication procedure at the completion of each job prior to storage.

1. Cageplate Cam Followers

The cageplate cam followers are sealed units, and do not require lubrication. However, the cageplate and rotary gear grooves in which the cam followers ride should be lightly greased. When the cageplate is rotated as a unit, the cam followers are exposed, and can be greased. Continue rotating the cageplate assembly until all cam followers, top and bottom, are greased (see first illustration below).

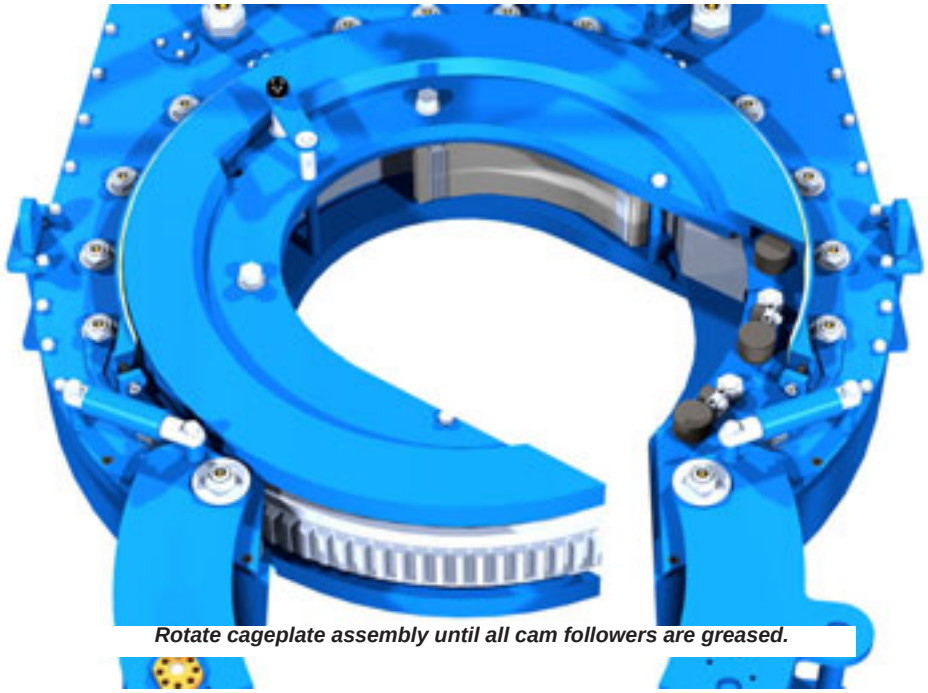


ILLUSTRATION 3.D.1: CAGEPLATE CAM FOLLOWER LUBRICATION

Rotate the rotary gear into the mouth opening as illustrated below. Apply grease to the top and bottom cageplate grooves. Continue to rotate the rotary gear and lubricate the grooves until the gear is well lubricated.

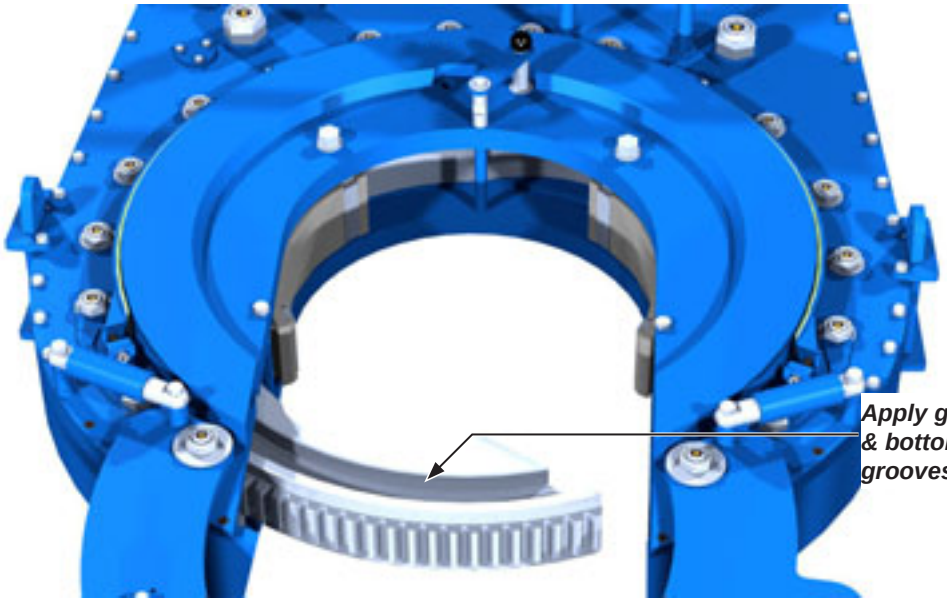


ILLUSTRATION 3.D.2: ROTARY GEAR LUBRICATION

DRILLING & COMPLETIONS | FARR
MCCOY MOVING GLOBAL ENERGY FORWARD

2. Support Roller Bearings

Lubricate support roller bearings through the grease fittings in the bottom ends of the rotary support roller shafts, located on the bottom face of the tong.

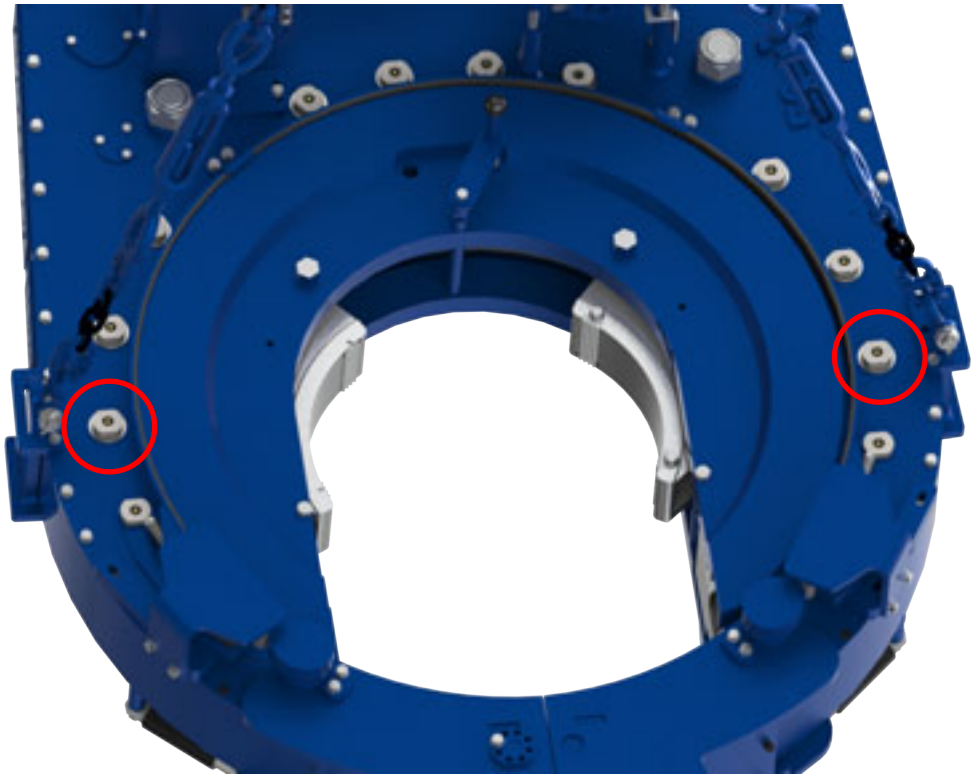


ILLUSTRATION 3.D.3: SUPPORT ROLLER LUBRICATION

The safety door cam weldments must be removed to lubricate the door pivot support roller bearings. Remove the two 3/8" x 1 " hex bolts amd 3/8" lock nuts securing the cam weldment to the door weldment, then remove the cam weldment to expose the support roller shaft. Lubricate support roller bearings through the grease fittings in the top end of the support roller shafts. Repeat for the other door pivot roller.

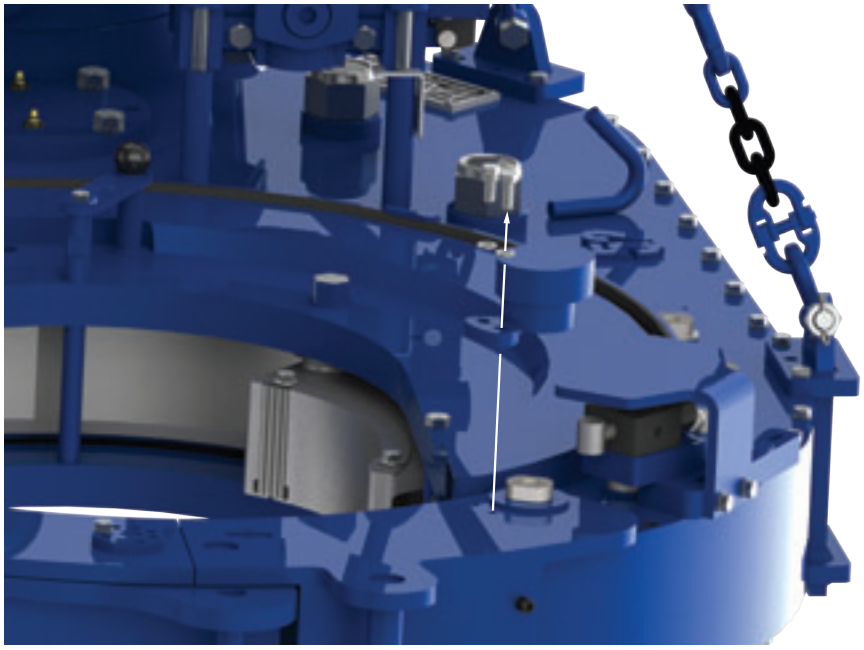


ILLUSTRATION 3.D.4: DOOR PIVOT ROLLER LUBRICATION

3. Rotary Idler Bearings

Apply grease to these bearings through the grease fittings in the ends of the rotary idler shafts (total of four locations), located on each side of the tong.

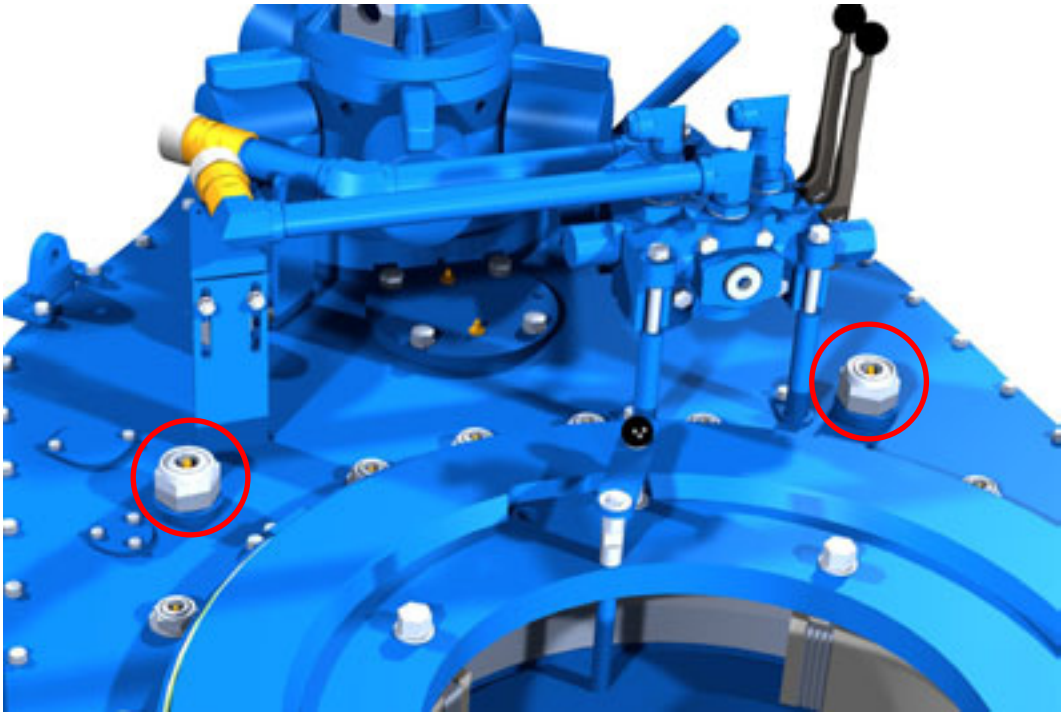


Illustration 3.D.5: Rotary IDler Lubrication

4. Pinion Idler Bearings

Apply grease to these bearings through the grease fittings in the ends of the idler half shafts, located on the bottom face of the tong.

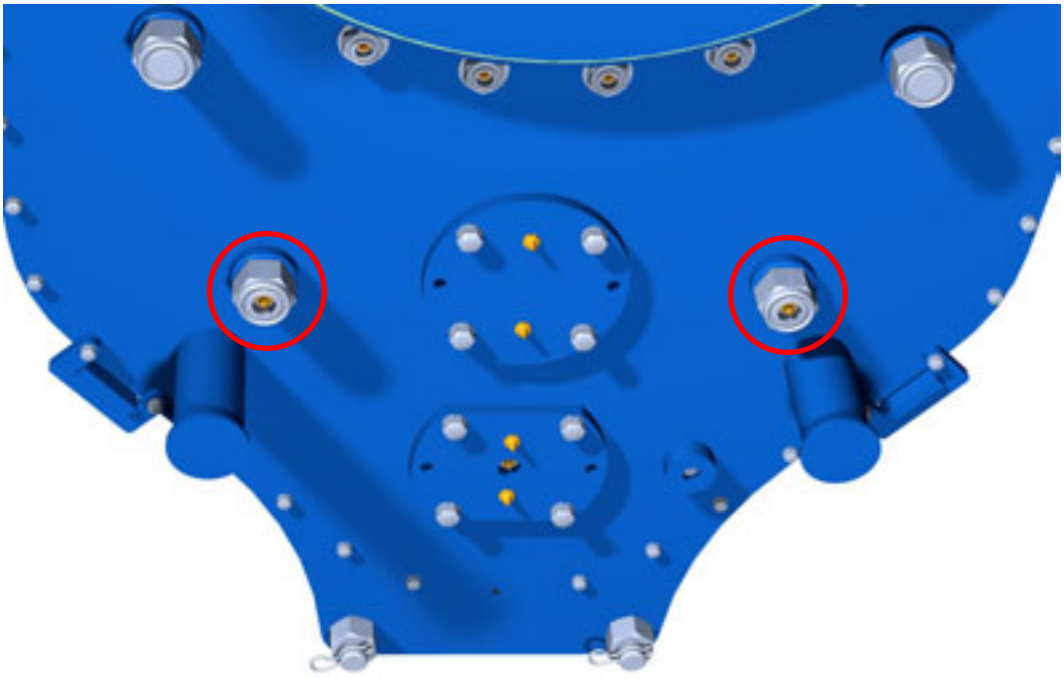


Illustration 3.D.5: Pinion Idler Lubrication

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

5. Pinion Bearings

Apply grease to these bearings through the grease fittings in the pinion bearing caps, which are located on the top and bottom face of the tong (four locations total).

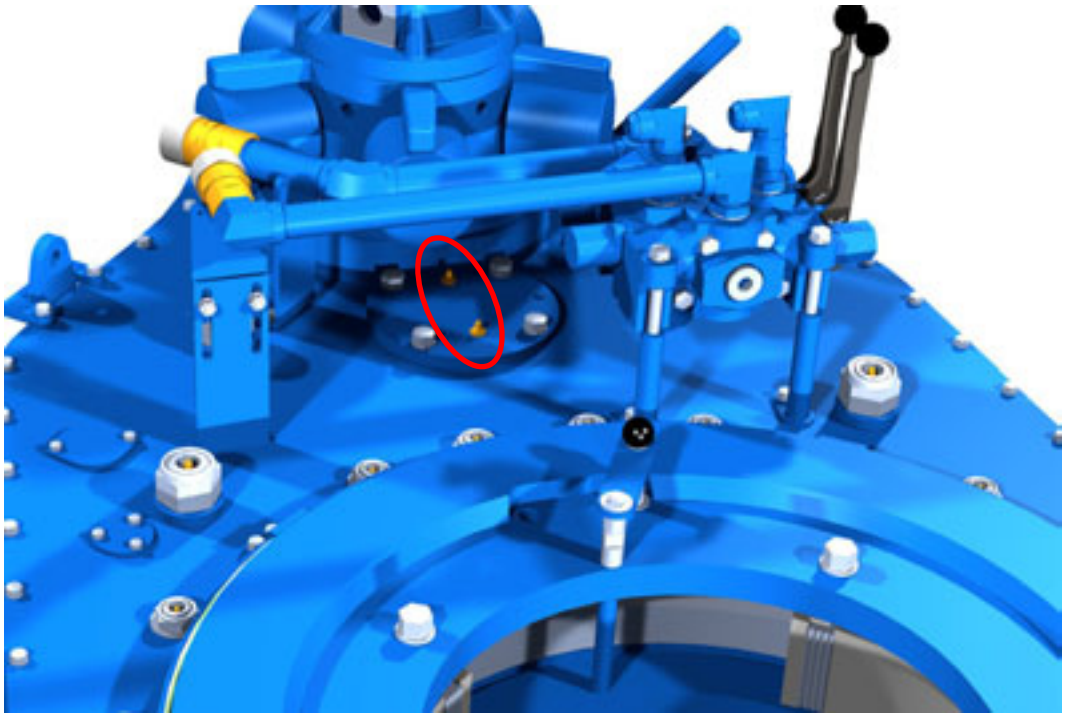


Illustration 3.D.6: Pinion Lubrication

6. Clutch Shaft

Apply grease to these bearings through the grease fittings in the clutch bearing cap which is located at the bottom face of the tong. Do not neglect to apply grease to the middle fitting, which is inset in the bearing cap.

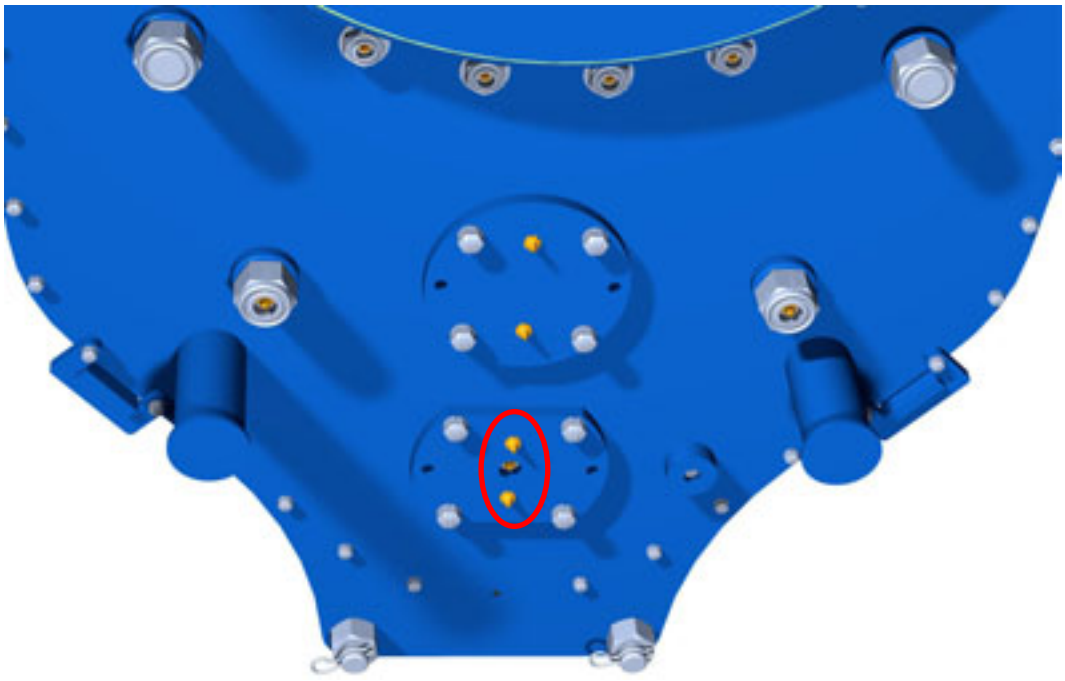


Illustration 3.D.7: Clutch Lubrication

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

7. *Shifting Shaft*
Apply grease to the shifting shaft and shifting shaft bushings, which may be accessed through the cover plate on the side of the tong.

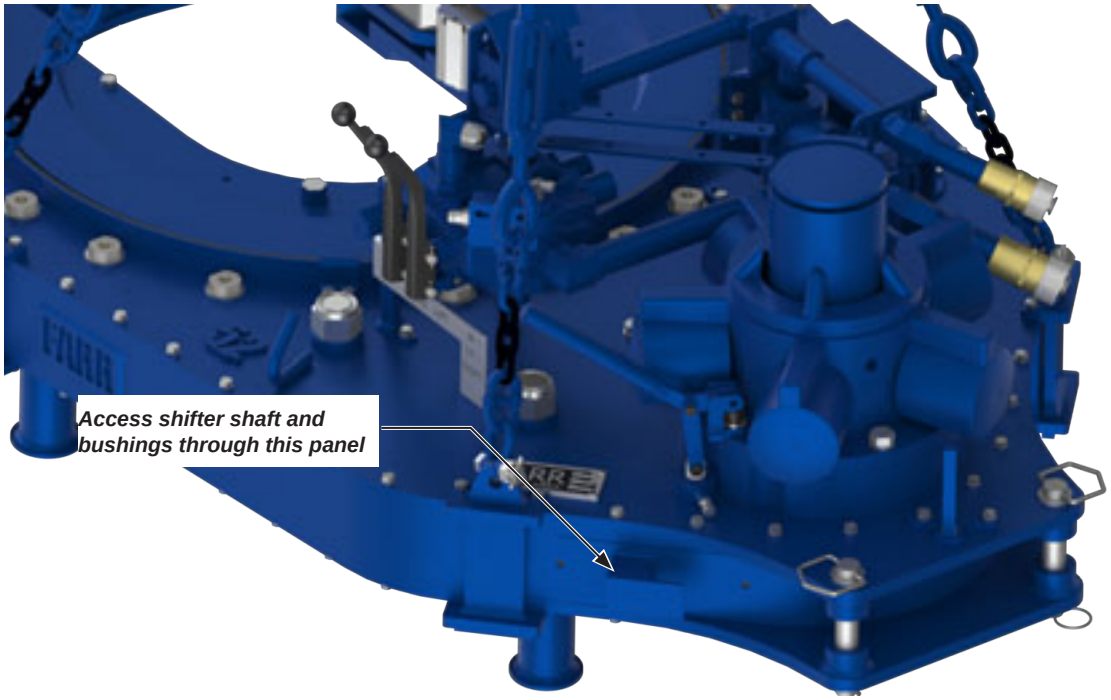


Illustration 3.D.8: Shifter Component Lubrication Access

8. *Jaw Rollers*
Apply grease to the jaw rollers through the grease fitting at the end of the jaw roller pin.

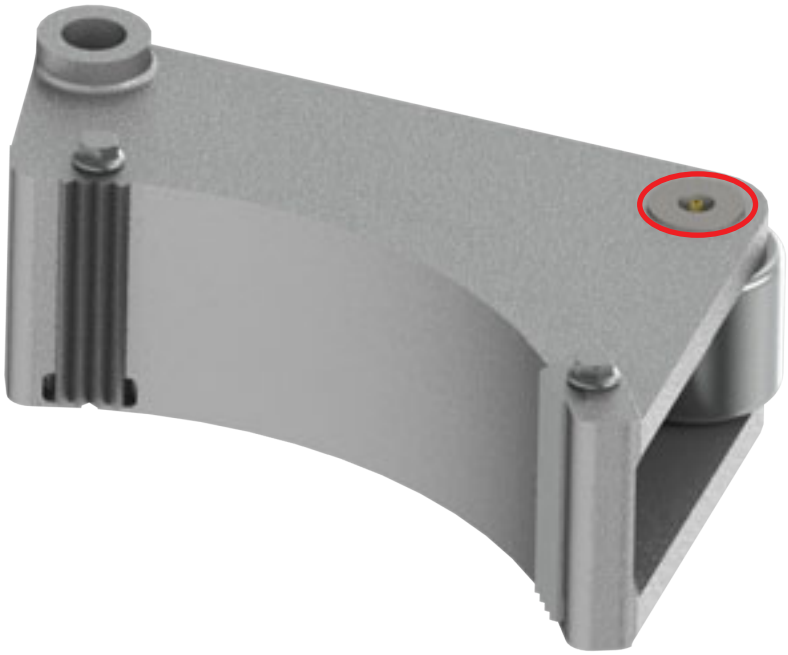


Illustration 3.D.9: Jaw Roller Lubrication

Farr recommends that a liberal coating of grease be applied to the cam surface of the rotary drive gear prior to jaw installation. Also, the clutch inspection plate should periodically be removed, and a liberal coating of grease applied to the clutch, drive gears and shifting shaft.

DRILLING & COMPLETIONS | FARR
MCCOY MOVING GLOBAL ENERGY FORWARD

9. DOOR STOP CYLINDER

Periodically disassemble the door stop cylinders and coat the spring and cylinder with a general purpose lubricating oil.

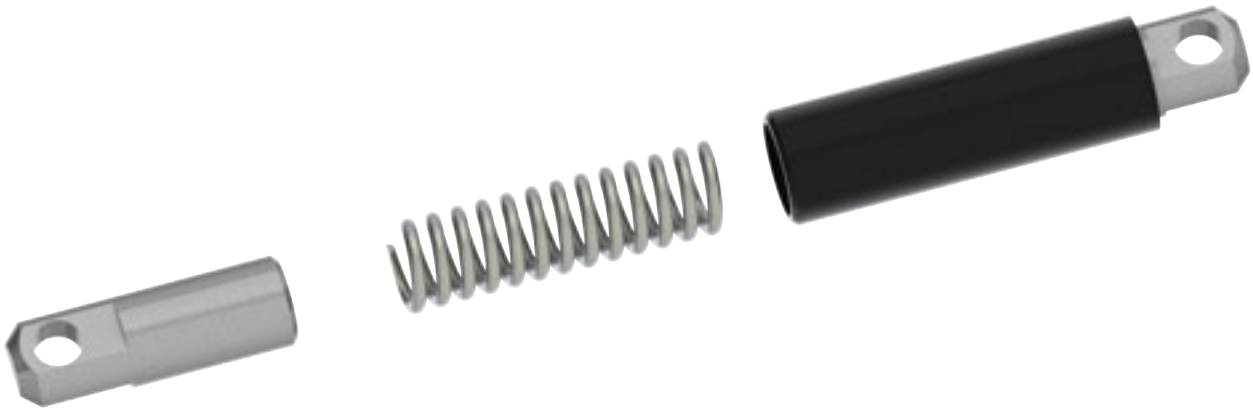


ILLUSTRATION 3.D.10: DOOR CYLINDER

E. ADJUSTMENTS

1. Brakeband Adjustments:

The brake bands must be periodically adjusted to continue to provide smooth and efficient jaw cam action. If the cage plate turns with the rotary gear, the jaws will not cam properly and, therefore, will not bite on the tubing or casing. Tightening the brake band against the cage plates will increase frictional resistance, allowing jaws to cam properly and grip the casing. Adjust the brake band using the adjustment nut and bolt set as shown in the illustration below. Do not over-tighten, as this causes excessive wear to the brake bands. Ensure top and bottom brakebands are adjusted at the same time.

TOP AND BOTTOM BRAKEBANDS MUST BE ADJUSTED SIMULTANEOUSLY

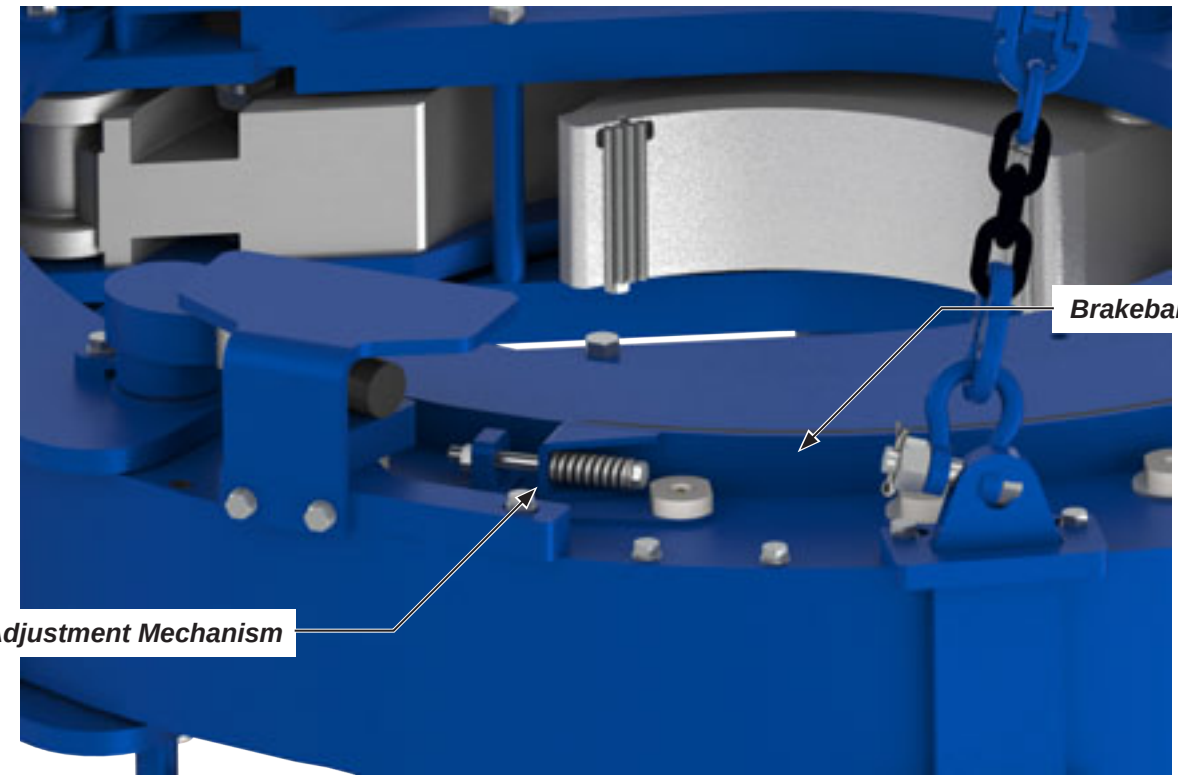


ILLUSTRATION 3.E.1: BRAKEBAND ADJUSTMENT

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

2. Door Latch Adjustment:

Normal operation of the tong may cause wear of the door latch, which will cause the door to develop a loose fit at the latch. Two latch cam plates are located on the right-hand door assembly, one on the top of the weldment and one on the bottom (see Illustration 3.E.2 next page). The cam plates have eight positioning holes located on a 360 degree bolt circle. The latch cam shaft extends down through the door and is secured at the top by a 3/8" hex head bolt. To make adjustments in door alignment, remove the 3/8" bolt and turn the cams with a wrench. When the door has been adequately aligned, replace the 3/8" bolt.

ADJUST BOTH DOOR LATCH CAMS SIMULTANEOUSLY - ROTATE BOTH LATCH CAMS THE SAME AMOUNT IN THE SAME DIRECTION.

THE DOOR IS AN IMPORTANT PART OF THE STRUCTURAL INTEGRITY OF THE TONG. IT IS IMPERATIVE TO KEEP A SECURE FIT AT THE DOOR IN ORDER TO MAINTAIN PROPER GEAR ALIGNMENT, AND TO MINIMIZE THE POSSIBILITY OF DAMAGE TO THE GEARTRAIN WHEN OPERATING THE TONG AT SPECIFIED TORQUE. A CLOSED DOOR ALSO ENSURES SAFETY OF OPERATING PERSONNEL.

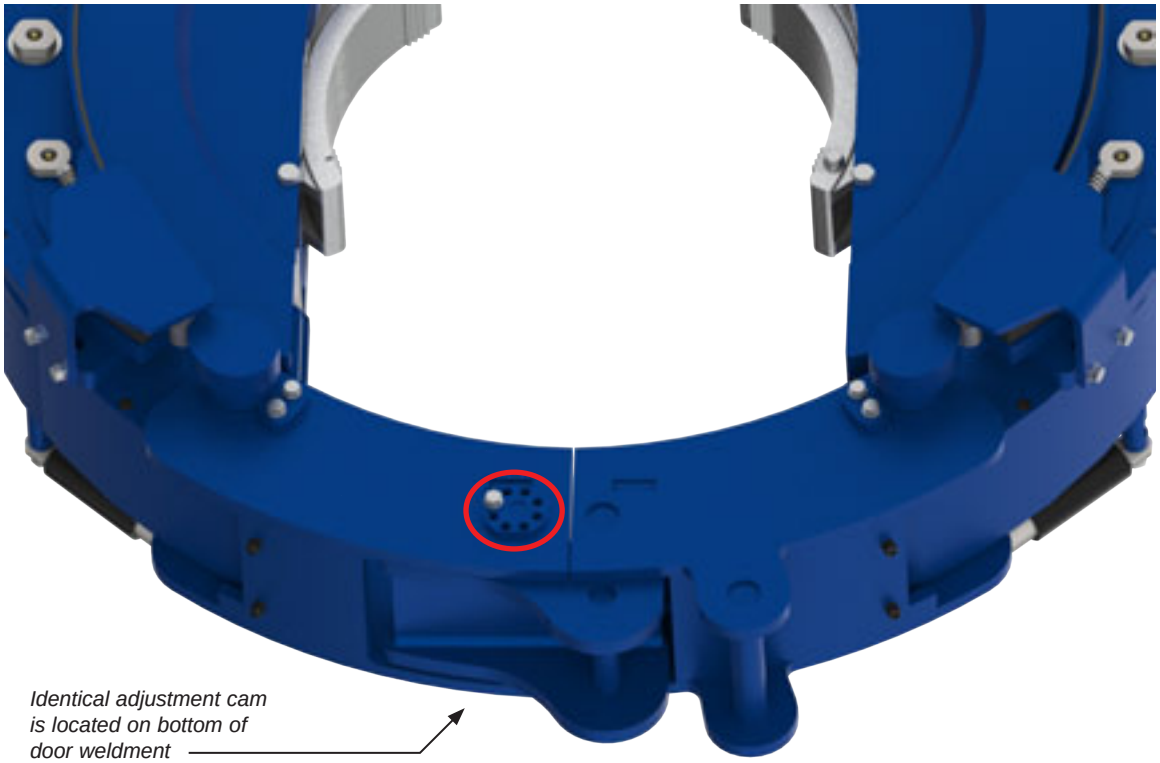


ILLUSTRATION 3.E.2: DOOR LATCH ADJUSTMENT CAMS

3. Door Alignment

Each door weldment is equipped with two set screws, along with jam nuts to lock position, to align the door when it is in the closed position.

Initial Alignment

Ensure tong doors are closed, and inspect how one door aligns with the other at the point at which they meet. If misalignment is seen, choose one or the other door to adjust. Use a box-end wrench to loosen the lock nuts on the insides of the door weldment - the nuts may be accessed from the side of the door weldment. Use a hex key to turn the hex head set screws either clockwise or counter-clockwise to adjust the door. Note that the top and bottom of the door weldment may not need to be adjusted equally - each set screw should be adjusted independantly until the doors are aligned.

Final Alignment

Rotate the cageplate, and stop it when the inside circumference of the door is completely covered. Perform three measurements (see illustration below):

1) From the insides of the outer edge of each door weldment to the cageplate (2 measurements total).

2) From the exact centre point (where the two doors meet) to the cageplate.

DRILLING & COMPLETIONS | FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

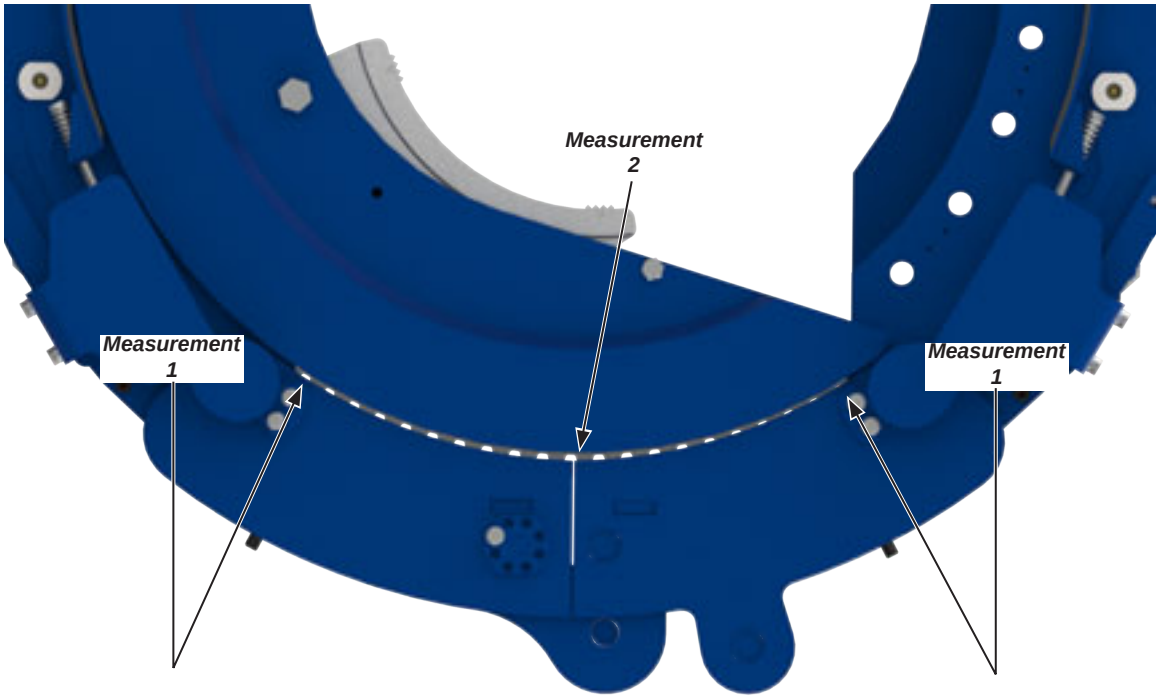


ILLUSTRATION 3.E.3: DOOR ALIGNMENT MEASUREMENT POINTS

The three measurements should be equal. If the centre measurement is less than the two outside measurements, loosen all four locking nuts on the set screws, and turn all four set screws EQUALLY clockwise, until the centre measurement is equal to the two outer measurements. If the centre measurement is more than the two outside measurements, loosen all four locking nuts on the set screws, and turn all four set screws EQUALLY counter-clockwise, until the centre measurement is equal to the two outer measurements. Ensure that the locking nuts are tightened when this procedure is complete.

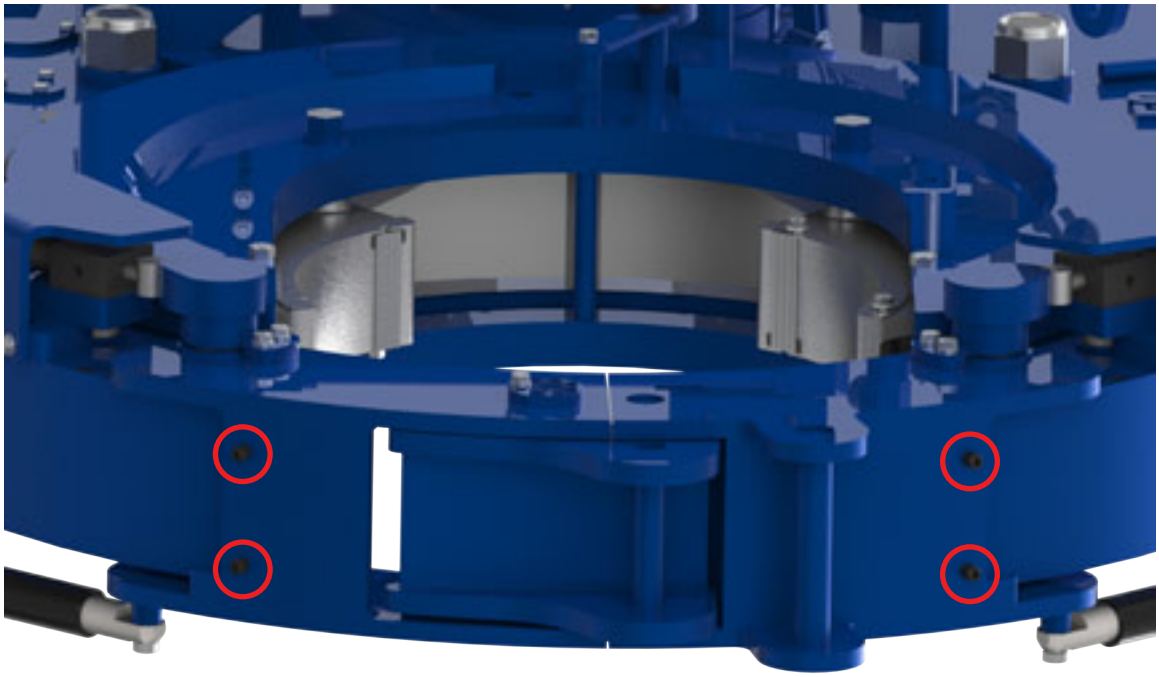


ILLUSTRATION 3.E.4: DOOR ALIGNMENT ADJUSTMENT SET SCREWS

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

4. Shifter Detent Adjustment:

Over time wear to the shifting shaft, wear to the detent ball, and loss of spring tension in the detent spring may result in a loose or "sloppy" fit within the top shifter bushing. The detent pressure may be increased or otherwise adjusted by loosening the 7/16" UNF locking jam nut, and turning the 7/16" UNF detent bolt. Should adequate detent action not be achieved, the shifting shaft, detent ball, or detent spring (or possibly all three) may need to be replaced *(see Pp. 5.16 - 5.17).*

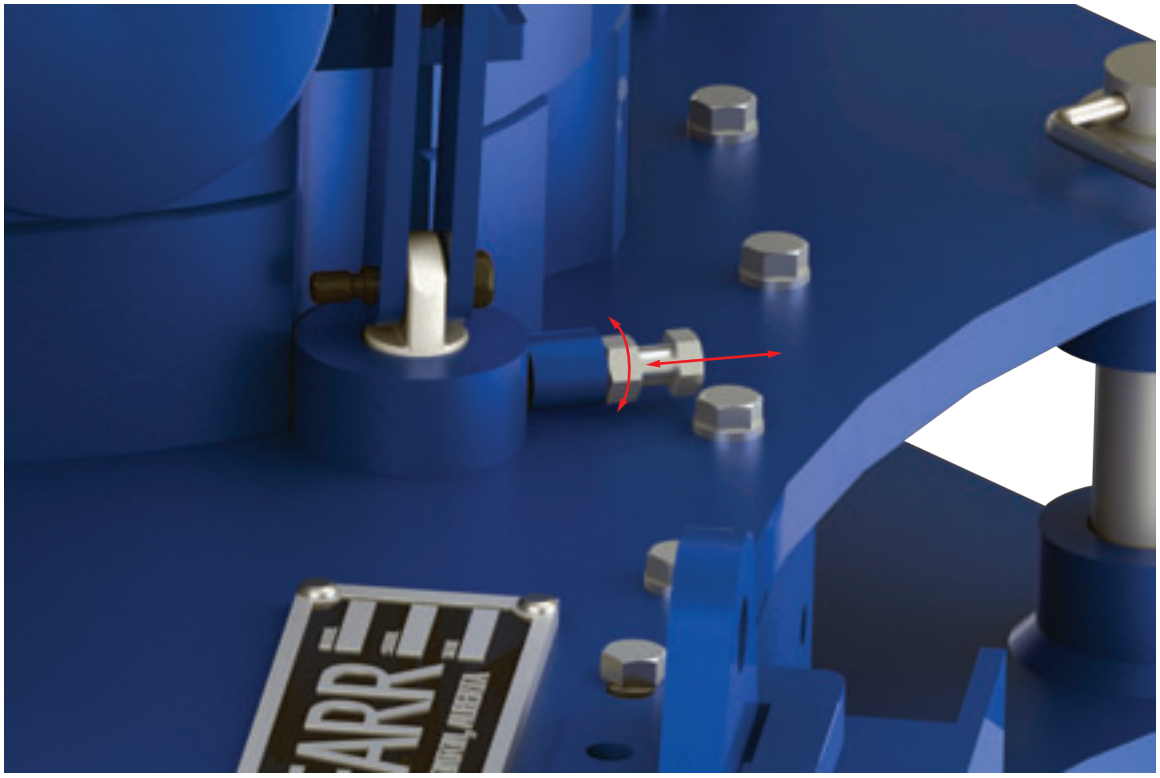


Illustration 3.E.5: Shifter Detent Adjustment

5. Safety Door Switch Adjustment:

The safety door switch should interrupt hydraulic power to the motor when the tong door is opened, or even slightly ajar. This is a critical safety system, and proper adjustment is necessary to maintain the intended function. If the rotary gear does not stop immediately and completely stop rotating when the door is opened, remove the tong from service and perform the following adjustments:

1. *Set the tong up in a controlled testing environment without connecting hydraulic power.*
2. *Open the tong door and check operation of the safety door switch plunger. Depress and allow it spring back several times to ensure smooth operation. If the plunger binds or jams, remove the switch and thoroughly clean and lubricate the plunger before reinstalling.*
3. *Test the switch plunger after cleaning and reinstallation. The plunger should spring back when depressed. If the plunger does not smoothly spring back, replace the switch.*
5. *Connect hydraulic power to the tong.*
6. *Ensure the door is closed and all personnel are clear. Begin rotating the cageplate. Open the tong door - the cageplate should immediately and completely stop.*
7. *Release all controls, and close the tong door again. Ensure the cageplate rotates with the door closed.*
8. *If cageplate continues to rotate with the door open, further adjustment of the safety door switch is necessary. Remove hydraulic power from the tong.*
9. *Adjust the position of the switch by adjusting the mounting plate. Remove the safety door switch guard. Slightly loosen the 3/8" mounting bolts on the mounting block and use a hammer to lightly tap the block toward the cam weldment. Perform each adjustment in very small increments before re-tightening the mounting bolts and testing switch function (see Illustration 3.E.6)*

DRILLING & COMPLETIONS | FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Safety Door Switch Adjustment (Continued):

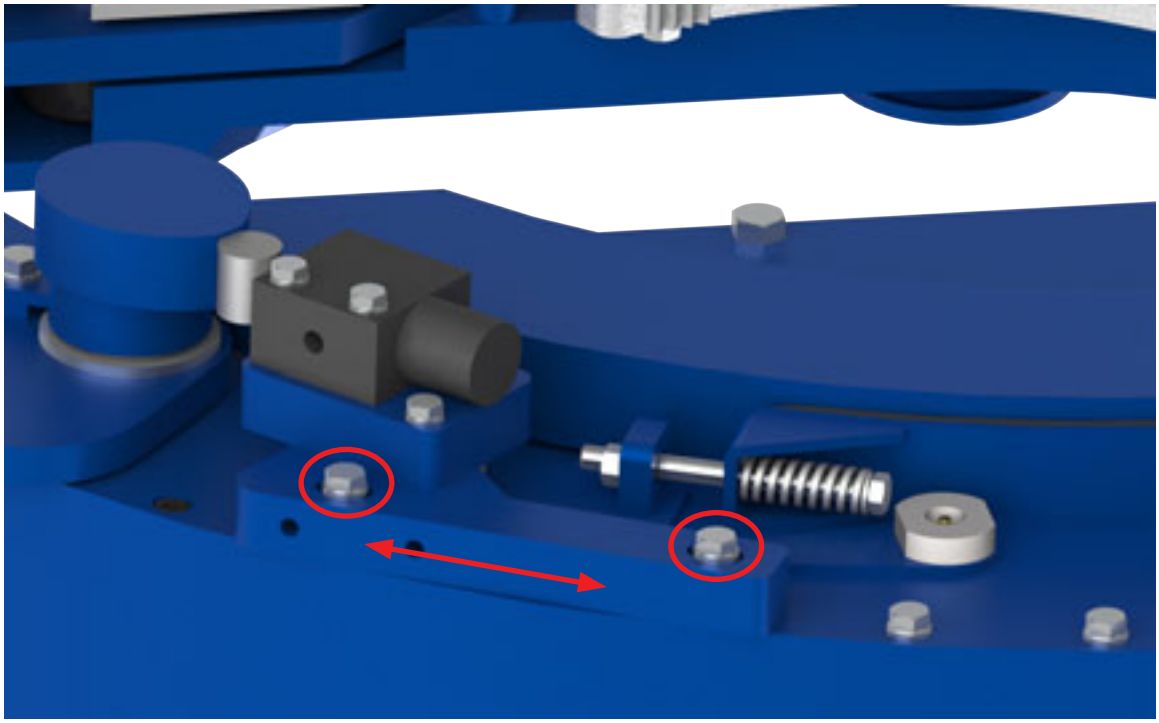


ILLUSTRATION 3.E.6: SHIFTER DETENT ADJUSTMENT

10. *Repeat steps 5 through 9 as many times as necessary to properly adjust the safety door switch. Once the switch has been satisfactorally adjusted the tong my be returned to service.*
11. *If the adjustment limit is reached without proper safety door function being reestablished, further maintenance is required:*

- *inspect safety door switch plunger and cam weldments. If either has been worn to the extent that adjustment of the switch position cannot compensate for the "wear-and-tear", replacement of the cam weldment or switch (or both) is necessary.*
- *if mechanical parts of the safety door switch appear to be in satisfactory condition, and safety door function still cannot be reestablished, troubleshooting of the hydraulic system is required. Perform necessary repairs before returning the tong to service.*

DO NOT PLACE A TONG WITH A MALFUNCTIONING SAFETY DOOR SYSTEM IN SERVICE

F. RECOMMENDED PERIODIC CHECKS

1. DOOR STOP SPRING

The spring inside the actuator cylinder must be of sufficient strength to enable the door latch mechanism to snap closed properly, and to hold the door in the open position when opened. Door stop spring fatigue will result in sluggish latch operation. Replace the latch spring inside the cylinder when this occurs.

2. BACKING PIN

Perform a visual inspection of the backing pin after each job. Replace the pin if stress cracks or excessive wear is found, or if either pin is bent.

3. SHIFTING SHAFT

The shifting yoke is secured to the shifting shaft by one hex jam nut above the shifting yoke, and one locknut on the bottom of the yoke. Check these nuts after each job. Do this by removing the clutch inspection plate and ensuring a snug fit prior to lubrication.

4. TORQUE GAUGE ASSEMBLY

Periodic calibration of the torque gauge is recommended to assure accurate torque readings. When having the torque gauge serviced and calibrated, it is critical to note the arm length of the tong, as indicated in the "Specifications" section. Farr recommends that the torque gauge assembly be calibrated yearly. Periodically check to ensure the load cell is filled with oil (see Section 6).

DRILLING & COMPLETIONS | FARR
MCCOY MOVING GLOBAL ENERGY FORWARD

G. OVERHAUL PROCEDURES

The tong may be overhauled following the disassembly instructions in the following procedure. Access to the gear train is possible by removing the top plate of the tong.

ALL MAINTENANCE AND OVERHAUL SHOULD BE PERFORMED FROM THE TOP. THE BOTTOM PLATE OF THE TONG IS TYPICALLY WELDED TO THE SIDE BODY AND CANNOT BE REMOVED.

REPLACEMENT FASTENERS (BOLTS, NUTS, CAP SCREWS, MACHINE SCREWS, ETC.) USED DURING MAINTENANCE OR OVERHAUL MUST BE GRADE 8 OR EQUIVALENT UNLESS OTHERWISE SPECIFIED.

TIGHTENING TORQUE GUIDE			
SAE GRADE 8 - FINE THREAD			
SIZE	CLAMP LOAD	PLAIN	PLATED
1/4 - 28 (.250)	3,263	14 ft. lbs.	10 ft. lbs.
5/16- 24 (.3125)	5,113	27 ft. lbs.	20 ft. lbs.
3/8 - 24 (.375)	7,875	49 ft. lbs.	37 ft. lbs.
7/16 - 20 (.4375)	10,650	78 ft. lbs.	58 ft. lbs.
1/2 - 20 (.500)	14,400	120 ft. lbs.	90 ft. lbs.
9/16 - 18 (.5625)	18,300	172 ft. lbs.	129 ft. lbs.
5/8" - 18 (.625)	23,025	240 ft. lbs.	180 ft. lbs.
3/4 - 16 (.750)	33,600	420 ft. lbs.	315 ft. lbs.
7/8" - 14 (.875)	45,825	668 ft. lbs.	501 ft. lbs.
1 - 12 (1.000)	59,700	995 ft. lbs.	746 ft. lbs.
1 - 14 (1.000)	61,125	1019 ft. lbs.	764 ft. lbs.
1 1/8 - 12 (1.125)	77,025	1444 ft. lbs.	1083 ft. lbs.
1 1/4 - 12 (1.125)	96,600	2012 ft. lbs.	1509 ft. lbs.
1 3/8 - 12 (1.375)	118,350	2712 ft. lbs.	2034 ft. lbs.
1 1/2 - 12 (1.500)	142,275	3557 ft. lbs.	2668 ft. lbs.
SAE GRADE 8 - COARSE THREAD			
SIZE	CLAMP LOAD	PLAIN	PLATED
1/4 - 20 (.250)	2,850	12 ft. lbs.	9 ft. lbs.
5/16- 18 (.3125)	4,725	25 ft. lbs.	18 ft. lbs.
3/8 - 16 (.375)	6,975	44 ft. lbs.	33 ft. lbs.
7/16 - 14 (.4375)	9,600	70 ft. lbs.	52 ft. lbs.
1/2 - 13 (.500)	12,750	106 ft. lbs.	80 ft. lbs.
9/16 - 12 (.5625)	16,350	153 ft. lbs.	115 ft. lbs.
5/8" - 11 (.625)	20,325	212 ft. lbs.	159 ft. lbs.
3/4 - 10 (.750)	30,075	376 ft. lbs.	282 ft. lbs.
7/8" - 9 (.875)	41,550	606 ft. lbs.	454 ft. lbs.
1 - 8 (1.000)	54,525	909 ft. lbs.	682 ft. lbs.
1 1/8 - 7 (1.125)	68,700	1288 ft. lbs.	966 ft. lbs.
1 1/4 - 7 (1.125)	87,225	1817 ft. lbs.	1363 ft. lbs.
1 3/8 - 6 (1.375)	103,950	2382 ft. lbs.	1787 ft. lbs.
1 1/2 - 6 (1.500)	126,450	3161 ft. lbs.	2371 ft. lbs.

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Disassembly Procedures (Continued):

1. *Remove load cell assembly and load cell pin while tong is suspended (if equipped).*
2. *Securely support tong from the bottom. Ensure the supports are capable of supprting the entire weight of the tong.*
3. *Remove the chain sling assembly.*
4. *Disconnect the hydraulic connections from the motor. Undo the restraints securing the inlet and outlet lines from their supports, and remove the two 1/2" hex bolts securing the valve assembly to the support post weldments. Lift the hydraulic section away from the tong.*
5. *Remove the four tong hangers.*
6. *Remove the torque gauge mount assembly from the rear top plate of the tong.*
7. *Remove the top and bottom brakeband assemblies.*
8. *Remove the tong doors:*
   - i. *Remove the door cylinders.*
   - ii. *Remove the thin nylock nuts and large flatwashers from the top of the two door pivot roller shafts.*
   - iii. *Ensure each door assembly is well-supported when performing this next step. Use a soft alloy material (e.g. brass rod, etc.) to lightly tap the shaft down through the support roller assembly until it drops out. Use caution that the threads on the ends of the support roller shafts are not damaged.*
9. *Disconnect the shifting handle from the shifting shaft and shifting lug.*
10. *Remove the motor from the motor mount. Staffa motors are secured with five 3/4" bolts, while Rineer motors are secured with six 5/8" bolts. Inspect the splined motor shaft for clashing or spline damage.*
11. *Remove the motor mount by removing the five socket head cap screws. The motor mount can be lifted out of place. Take care not to lose the two position dowels - one, or both, may come off with the mount.*
12. *Remove the access panel on the body side adjacent to shifter assembly. Back off the detent adjustment bolt on the top shifter bushing. Remove the 7/8" jam nut from the shifting shaft to loosen the shifting fork. The shifting shaft may now be carefully rotated and pulled out of the top shifter bushing.*

THE CAGE PLATE BOLTS ARE THE ONLY ITEMS FASTENING THE BOTTOM CAGE PLATE TO THE TONG. SUPPORT THE BOTTOM CAGE PLATE FROM BELOW PRIOR TO REMOVING CAGE PLATE BOLTS IN ORDER TO PREVENT DAMAGE TO THE BOTTOM CAGE PLATE OR PERSONAL INJURY TO THE MECHANIC

13. *Remove the jaw pivot bolts and the jaw assemblies.*
14. *Remove the 3/8" hex bolt connecting the backing pin to the rear cage plate bolt. Remove the backing pin.*
15. *Remove the two front cage plate bolts, and the rear cage plate bolt, and the cageplate spacers. The cage-plates may now be removed. Use caution not to damage the cam followers while removing the cageplates.*
16. *Pull the top bearing cap and spacer for the pinion drive gear by removing the four 5/8" bolts which secure the bearing cap. Thread two of the removed bolts into the extra holes on top of the bearing cap, and use them as lifting lugs to lift the bearing cap out of place.*

IF THE BEARING REMAINS ATTACHED TO THE GEAR SHAFT AFTER THE BEARING CAP IS PULLED, FARR SERVICE PERSONNEL RECOMMENDS LEAVING IT IN PLACE UNTIL THE TOP TONG PLATE IS REMOVED.

17. *Remove the two 1-1/4" x 8" load cell anchor bolt assemblies from the rear of the tong.*
18. *Remove the top 1-1/2" nylock nuts and pads for the rotary and pinion idler gears.*
19. *Remove the top roller shaft thin nylock nuts and washers. Note that the top brakeband lug weldments will be released.*
20. *Remove the top plate fasteners (hex head bolts & socket head cap screws) around the perimeter of the tong which secure the top plate to the gear case housing. Note that the rear door cylinder mounting lugs must also be removed to release the top plate.*
21. *Use a soft alloy material (e.g. brass rod, etc.) to lightly tap the remaining support roller shafts down through the support roller assemblies until they are roughly flush with the top plate of the tong. Use caution that the threads on the ends of the support roller shafts are not damaged.*
22. *With all the above steps taken, the top tong plate can be lifted off providing access to the inside of the gear case. Use this opportunity to inspect the cam follower array mounted on the top plate - replace damaged cam followers.*

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

H. ASSEMBLY PROCEDURES

Assembly of Farr Hydraulic Power Tongs is simple, and can be accomplished without the use of special tools. The instructions on this page are presented as a guide only, and are similar to the assembly sequence our technician would use while assembling the tong in our plant.

REFER TO PAGE 3.11 FOR TORQUE SPECS WHEN TIGHTENING HEX BOLTS AND HEX HEAD CAP SCREWS.

ALL FASTENERS USED DURING REASSEMBLY OF LOAD-BEARING COMPONENTS (CHAIN SLINGS, RIGID SLINGS, BACKUP LEGS) MUST BE TIGHTENED TO THE CORRECT TORQUE. THREADED FASTENERS USED IN LOAD-BEARING DEVICES MUST BE SECURED WITH RED LOCTITE™.

Assembly of Farr Hydraulic Power Tongs is simple, and can be accomplished without the use of special tools. The instructions on this page are presented as a guide only, and are similar to the assembly sequence our technician would use while assembling the tong in our plant. However, much emphasis has been placed on disassembly and reassembly in the maintenance and overhaul section of this manual. It is, therefore, recommended that this assembly section be used only to aid in familiarization of parts and their locations, and the overhaul and maintenance section be used as a specific guide to assembly.

NOTE: INITIAL ASSEMBLY STEPS SHOWN WITHOUT TONG SIDE BODY FOR CLARITY

APPLY A THIN LAYER OF GREASE TO THE SURFACE OF EACH MOVING PART DURING ASSEMBLY TO AID IN THE ASSEMBLY PROCESS.

1. *Position the tong body gear case on a suitable stationary support such that the bottom body plate is accessible.*
2. *Install 25 cam followers (PN 02-0107) into the bottom plate as shown in the illustration. Secure each with a 7/8" lockwasher and 7/8" UNF jam nut.*

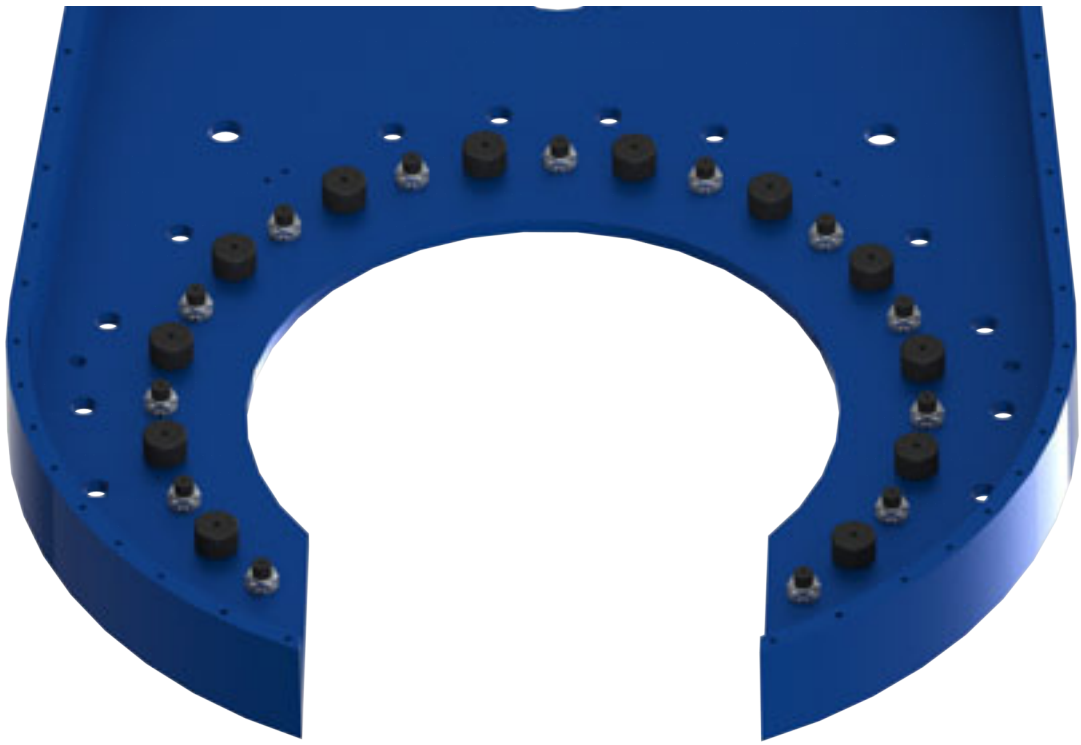


ILLUSTRATION 3.H.1: CAM FOLLOWER INSTALLATION - BOTTOM PLATE

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Assembly Procedures (Cont'd):

3. *Insert support roller inner spacer (PN 1037-C-134) into each support ("dumbell") roller. Press two support roller bearings (PN 02-0094) into each end of each support roller (16 assemblies total). Once the assembly of the support rollers is complete, temporarily slide the support roller shafts into each assembly for assistance in correctly positioning each support roller. NOT: do not include the two door pivot rollers in this step - only perform this action with the fourteen body rollers.*
4. *Place rotary gear on bottom plate, over the cam followers installed in Step 2. Note that the backing pin grooves are in the top side of the rotary gear*
5. *Rotate the rotary gear so that the opening in the gear faces the first three support roller positions closest to the mouth of the tong (do not include door pivot rollers at this point). Install three support roller assemblies, including shafts but not including fasteners, in the locations exposed in the rotary gear opening. Continue to rotate rotary gear around the tong, installing the support roller assemblies as the gear is rotated. Finish with the rotary gear aligned with the opening in the bottom plate.*

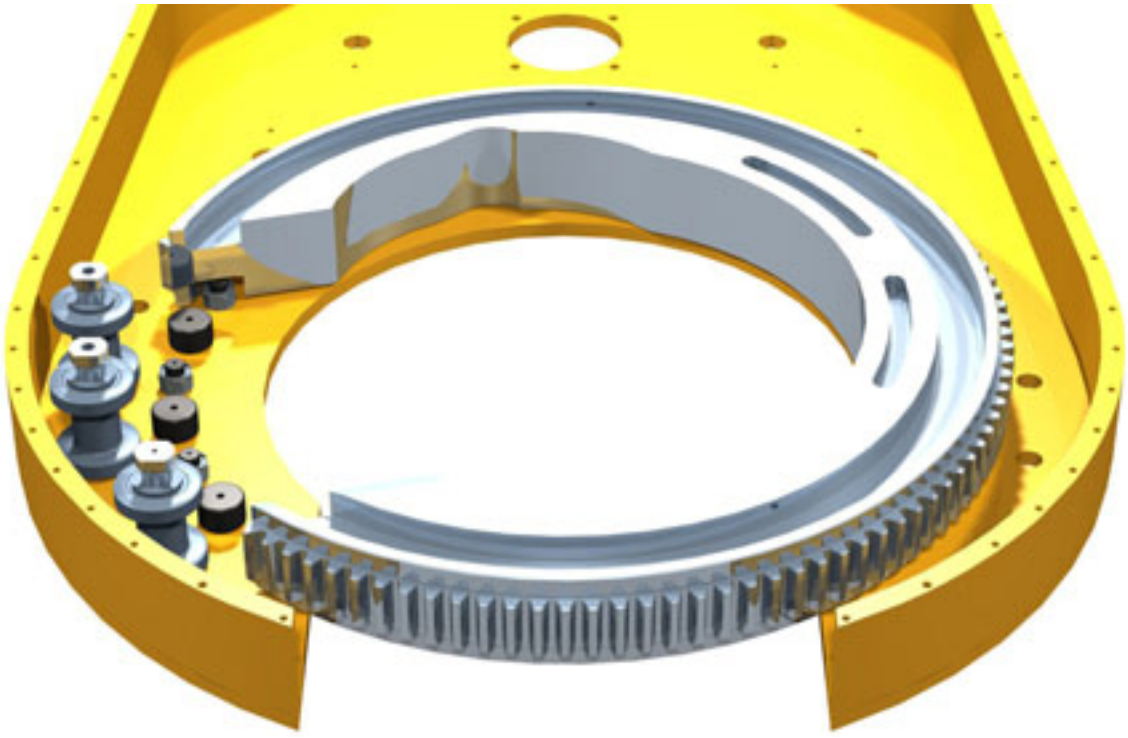


Illustration 3.H.2: Rotary Gear & Support Roller Installation

6. *Press pinion bearing (PN 02-0106) into bottom pinion bearing cap (PN 1037-C-33), and install bearing cap into bottom plate of tong using four 5/8" SS lockwashers and four 5/8" NC x 1-1/2" hex cap screws.*
7. *Press lower clutch bearing (PN 02-0105) into bottom clutch bearing cap (1037-C-17), and install bearing cap into bottom plate of tong using four 5/8" SS lockwashers and four 5/8" NC x 1-1/2" hex cap screws.*
8. *Install a retaining ring (PN 02-0009) into each of the two rotary idler gears (one each of PN 1037-D59 & 1037-D59-BJ). Press one each of the idler bearings (PN 02-0011) into each of the rotary idler gears, followed by a second retainer ring in each. Slide each rotary idler gear and bearing assembly over an idler shaft (PN 1050-D5-117) and centre as well as you are able.*
9. *Slide a bearing seal (PN 02-0010) over each end of the rotary idler shafts, ensuring that the "lip" on the seals are towards the centre bearing, followed by an idler spacer (PN 1050-D5-121) over each end of the shafts.*
10. *Attach the turn counter encoder (PN 1482-59-01) and encoder spacer (PN 101-1712) to the RH rotary idler gear stack using three 1/4" NC x 1" hex SHCS. Place each rotary idler assembly in their respective locations in the bottom plate, meshed with the rotary gear, and secure with an idler pad (PN 997-D20-125) and 1-1/2" UNF hex nylock nut. NOTE: as the rotary idler assemblies are placed vertically, the bearing seal and idler spacer on the bottom side will have to be held in place by hand as the assembly is lowered through the bottom plate.*

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Assembly Procedures (Cont'd):

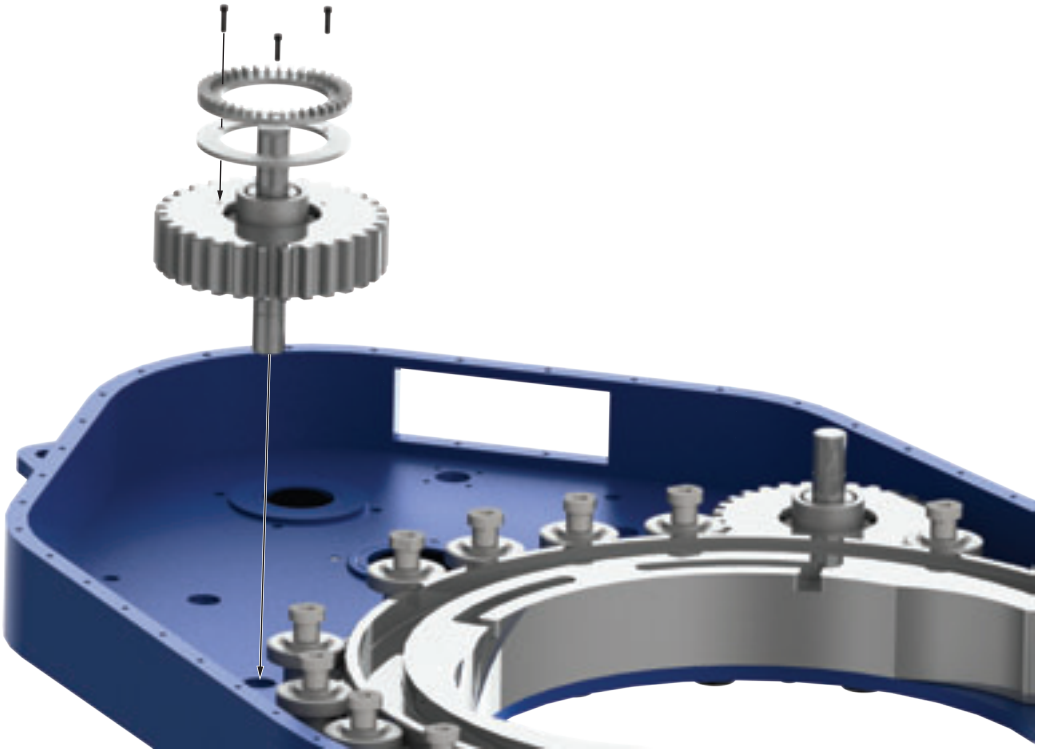


ILLUSTRATION 3.H.3: TURN COUNTER ENCODER & ROTARY IDLER INSTALLATION

11. *Slide low pinion gear (PN 1037-D-32) over bottom end of pinion gear shaft (PN 1037-D-15), and place end of pinion gear shaft into pinion bearing and bearing cap installed in Step 6. Ensure the gear keys (PN 1037-D-15A), are placed into the pinion gear shaft before installing gear (two keys per gear).*
12. *Install a retaining ring (PN 02-0009) into each of the two pinion idler gears (PN 1037-D-1). Press one each of the idler bearings (PN 02-0011) into each of the pinion idler gears, followed by a second retainer ring in each. Slide each pinion idler gear and bearing assembly over an idler shaft (PN 1050-D5-117) and centre as well as you are able.*
13. *Slide a bearing seal (PN 02-0010) over each end of the pinion idler shafts, ensuring that the "lip" on the seals are towards the centre bearing, followed by an idler spacer (PN 1050-D5-121) over each end of the shafts.*
14. *Install each pinion idler in their respective locations in the bottom plate. NOTE: when the pinion idler assemblies are placed vertically, the bearing seal and idler spacer on the bottom side will have to be held in place by hand as the assembly is lowered through the bottom plate. Once the assembly is through the bottom plate, place an idler pad (PN 997-D20-125) over the bottom end of each shaft, and secure the pads with a 1-1/2" UNF hex nut.*
15. *Slide clutch bearing (PN 02-0104) over the bottom end of the splined clutch shaft (PN 1037-D-38). Install two upper clutch bearings (PN 02-0103) over the top side of the clutch shaft. Press bearings tight to the center gear on the splined clutch shaft.*
16. *Slide the low clutch gear (PN 1037-D-40) over the lower bearing so that the larger diameter gear on the low clutch gear is tight to the center gear on the clutch shaft, and place end of clutch shaft into bottom clutch bearing installed in Step 7. Mesh the low clutch gear with the low pinion gear as it is installed.*
17. *Place the shifting collar (PN 1037-D-34) over the middle section of the clutch shaft.*
18. *Slide the high clutch gear (PN 1037-D-41) over the two top clutch bearings.*
19. *If not already done, insert the two remaining gear keys in the pinion gear shaft. Install the high pinion gear (PN 1037-D-12) over the top of the pinion gear shaft, meshing with the high clutch gear as it is installed.*
20. *Fasten the lower shifter bushing (PN 1037-C-21B) to the bottom plate with four 3/8" NC x 1-1/4" hex bolts and 3/8" lock-washers.*
21. *Place the shifting fork weldment (PN 1037-D-27) up against the shifting collar, roughly in its final position.*

DRILLING & COMPLETIONS | FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Assembly Procedures (Cont'd):

22. *Install 25 cam followers, PN 02-0107, in the top plate (PN 101-1723) as shown in the illustration below. Secure with 7/8" UNF jam nuts and 7/8" lockwashers.*

Illustration 3.H.4: Cam Follower Installation - Top Plate

23. *Carefully remove all the support roller shafts, ensuring the support roller assemblies do not shift position as you are doing so.*

24. *Insert three 3/8" x 1-1/2" hardened ground production dowel pins into the side body - one at exact rear centre, and one on either side of the front opening. Position the top plate in its proper location - use caution not to damage threads when aligning the top plate with the idler and support roller shafts. Ensure the plate is aligned exactly horizontal to prevent binding on the dowel pins. Use caution when aligning the previously installed cam followers with the rotary gear. Tap plate securely into place with a rubber mallet.*

25. *Secure the top plate with twenty-seven 3/8" NC x 1-1/2" hex bolts, two 3/8" NC x 1-1/4" hex bolts (install these two above the removeable access panel), and eight 3/8" NC x 1" hex socket cap screws. Note that fasteners are NOT to be installed at the chain sling hanger locations, circled in red in illustration 3.H.5.*

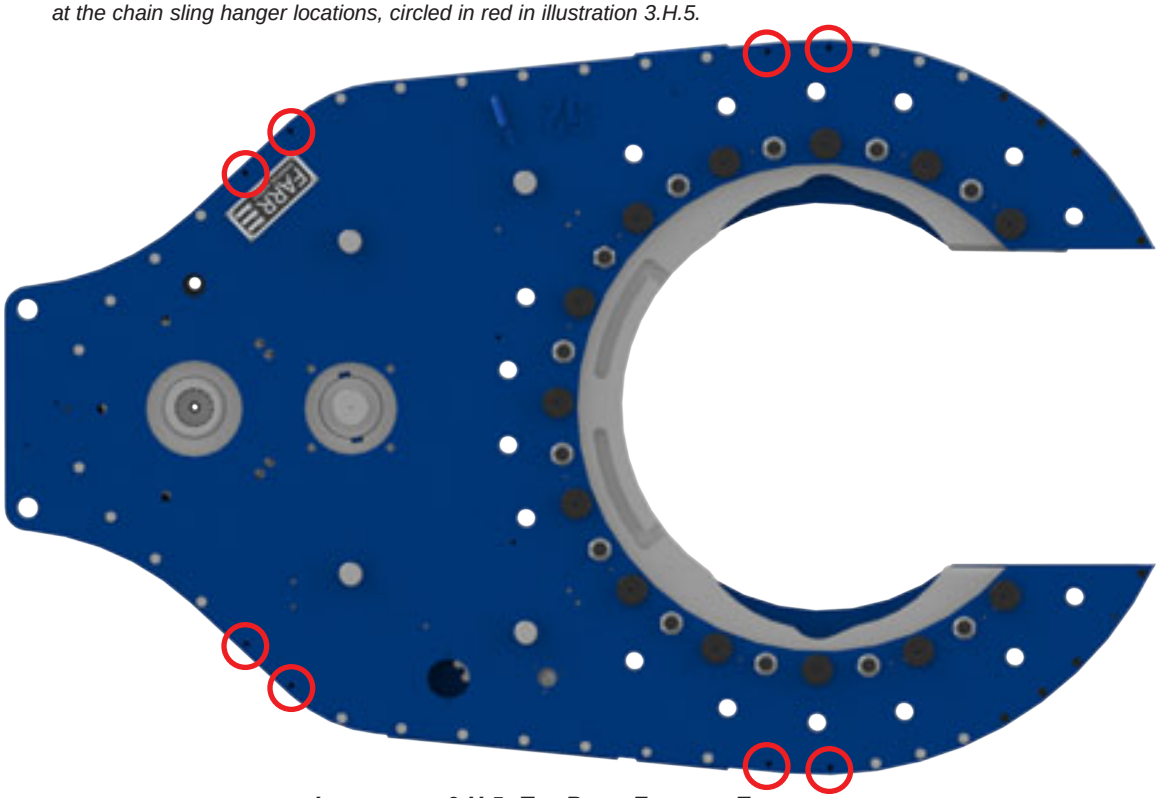


Illustration 3.H.5: Top Plate Fastener Exclusions

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Assembly Procedures (Cont'd):

26. *Install ten horizontal cam follower guides (PN 1037-A-49) to the top side of the top plate, and secure with 1/4" NC x 1-1/4" hex socket head cap screws and 1/4" high-collar lockwashers. Install ten horizontal cam followers (PN 02-0108) in the horizontal cam follower guides and secure each with a 7/16" UNF jam nut and 7/16" lockwasher.*

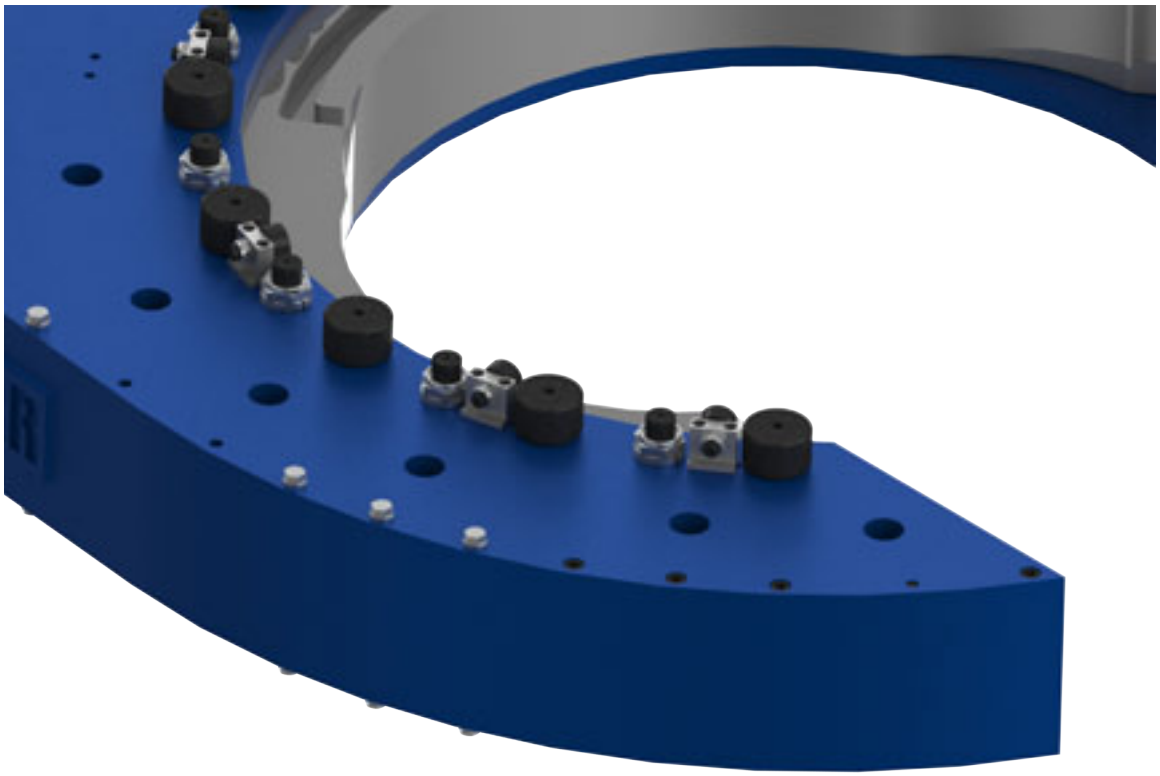


Illustration 3.H.6: Installation of Horizontal Cam Followers and Guides

27. *Re-install the support roller shafts:*

    Note that the two top and bottom brakeband lug weldments (top RH and bottom LH weldments are PN 101-1636, and the top LH and bottom RH weldments are PN 101-1637) are retained by four support roller shafts (as shown in illustration below). Secure the support roller shafts with 1" UNF SS wire-drilled jam nuts (PN 101-3922) and 1" narrow SS flatwashers (except where noted).

    Note that 1" narrrow flatwashers are not used where the support roller shafts are coincidental with the brakeband lug weldments.

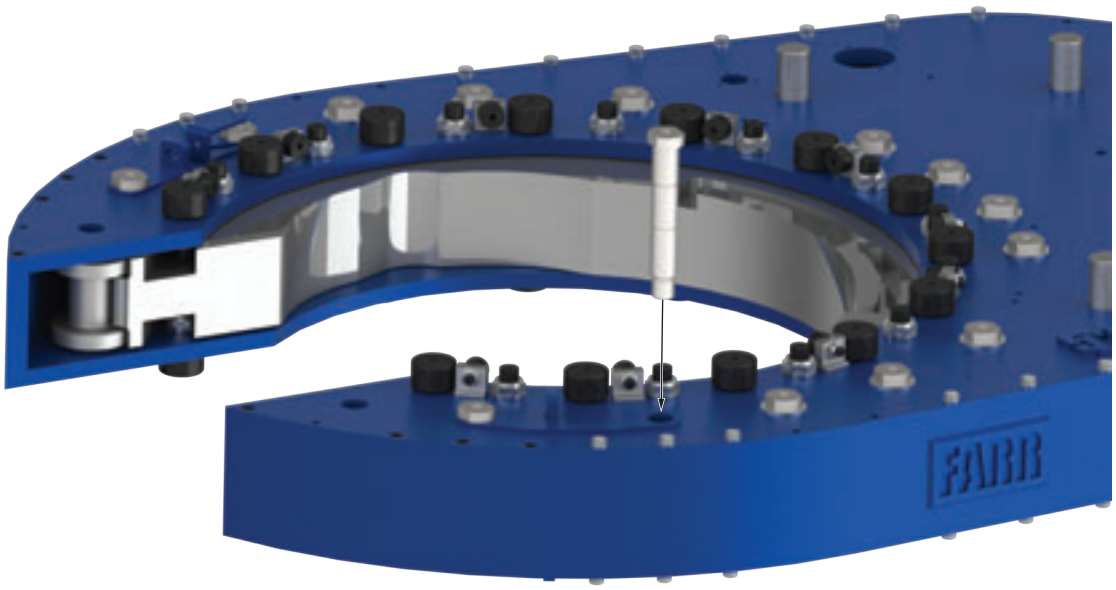


Illustration 3.H.7: Support Roller - Brakeband Weldment Installation

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Assembly Procedures (Cont'd):

28. *Install the remaining 1-1/2" UNF nylock nuts and idler pads over the tops of the four idler assemblies.*
29. *Press the remaining bearing in the pinion assembly into the top pinion bearing cap (PN 1037-C-10), and install the bearing cap in the top plate of the tong using four 5/8" lockwashers and four 5/8" NC x 1-1/2" hex cap screws. Note that the flat on the bearing cap faces toward the rear of the tong.*
30. *Place the motor thrust washer (PN 101-3289) over the top of the splined clutch shaft, followed by the motor spacer (PN 1037-D-38S).*
31. *Install the motor mount (PN 1037-D-7) ensuring that the flat on the motor mount is oriented toward the pinion bearing cap and the "notch" in the motor mount is oriented to accomodate the top shifter bushing. Secure with five 3/4" NC x 1-1/4" hex socket head cap screws and 3/4" lockwashers.*
32. *Install hydraulic motor (PN 87-0210B). Do not neglect to install the upper motor spacer, PN 1037-D-38S, between the top of the clutch shaft and the motor as per the previous step. Use caution to make sure the splines on the motor shaft are properly aligned with the grooves in the clutch shaft,*
33. *Secure the motor to the motor mount using four 3/4" NC x 2-1/2" hex bolts and 3/4 lockwashers, plus the shifter handle pivot lug weldment (PN 101-5114) and one 3/4" UNC x 2-3/4" hex socket head cap screw and 3/4" lockwasher at the hole location directly adjacent to the top shifter lug weldment.*

Illustration 3.H.8: Shifter Pivot Lug Weldment Installation

34. *Guide the shifting shaft (PN 1037-C-20A) through the top shifter bushing, and secure to shifting fork weldment using two 7/8" UNF hex jam nuts. Once the shifting fork has been secured, place the bottom of the shifting shaft into the lower shifting bushing.*
35. *Attach the "toe" of the shifting handle weldment (PN 1037-D-20B) to the shift pivot lug weldment using a 3/8" x 1-1/2" hex socket head shoulder bolt and 7/16" UNC thin nylock nut.*
36. *Connect the shifting handle weldment to the shifting shaft using two shifting links (PN 101-5116), two 3/8" x 1" hex socket head shoulder bolts, and two 7/16" UNC thin nylock nuts.*
37. *Insert the shifter detent ball (PN 02-0018) into the detent tube on the top shifter bushing. Insert the shifter detent spring (PN 997-0-64) into the detent tube. Thread a 7/16" UNF jam nut on to the 7/16" UNF x 1-1/4" hex bolt, and then thread the bolt into the end of the detent tube. Lock the bolt to the detent tube with the hex nut. See Pg. 3.7 for information about adjusting the shifter detent tension.*
38. *Position the bottom cageplate (PN 1037-D-51) against the bottom plate of the tong over the previously installed cam followers, and support until it is attached to the top cageplate.*

DRILLING & COMPLETIONS
MCCOY
MOVING GLOBAL ENERGY FORWARD
FARR

Assembly Procedures (Cont'd):

39. *Position the top cageplate (PN 101-1580) on the top plate of the tong over the previously installed cam followers. Secure the bottom cageplate to the top cageplate using two 1" NC x 8" hex bolts and the rear cageplate bolt (PN 1037-36). Do not neglect to install the three cageplate spacers (PN 1037-C-38) between the top and bottom cageplates.*

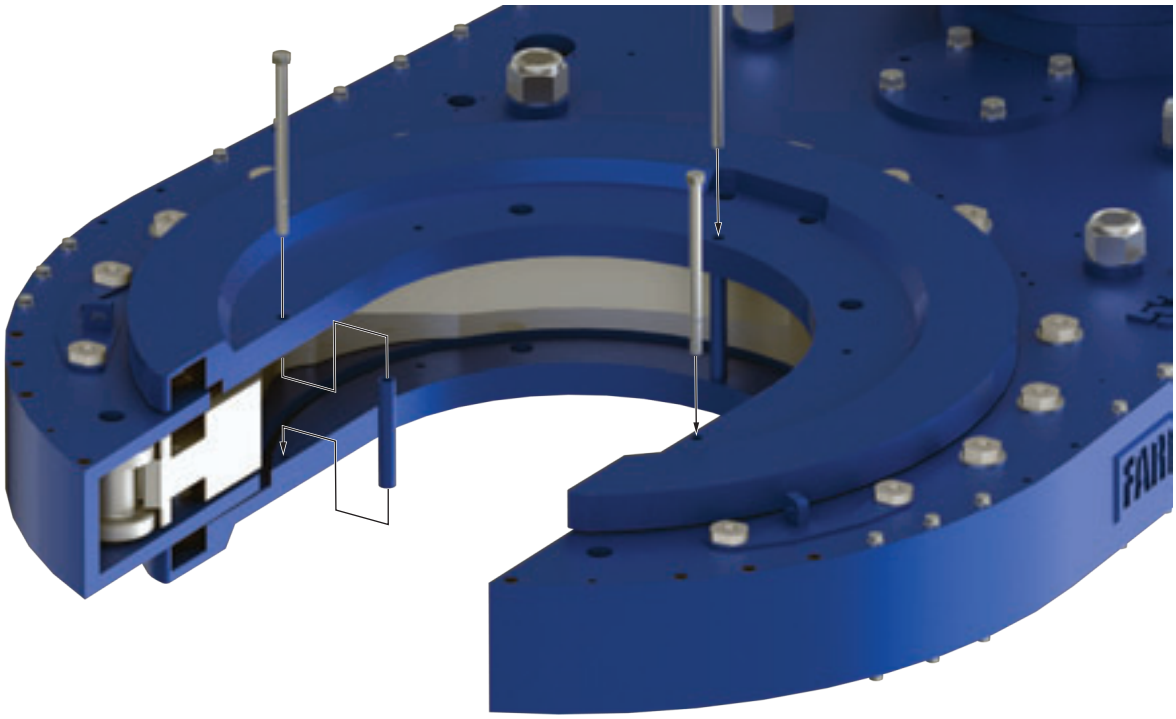


Illustration 3.H.9: Top & Bottom Cageplate Installation

40. *Press the four door pivot shoulder bushings (PN 101-0110) into the RH door weldment (PN 101-1703) and the LH door weldment (PN 101-1697). The bushings are installed so that the shoulders are towards the inside of the weldments.*

41. *Install latch weldment (PN 101-1570) onto RH door assembly (see Pp. 5.32 - 5.33). Install two latch springs between the latch weldment and the door weldment, and secure latch to RH door using the door latch shaft (PN 1037-C-200) and two latch cam plates (PN 1037-C-151). Secure each latch cam plate to the top and bottom door plates with one 3/8" UNC x 1-1/4" hex bolt and 3/8" lockwasher.*

42. *If not already done install the door pivot roller components that fit between the two body plates, i.e. everything except the roller shafts, nuts, washers, and door stop spacers.*

43. *Install the threaded door cylinder posts (101-0446), one on each side of the bottom plate, adjacent to the brakeband lug weldments on the bottom plate.*

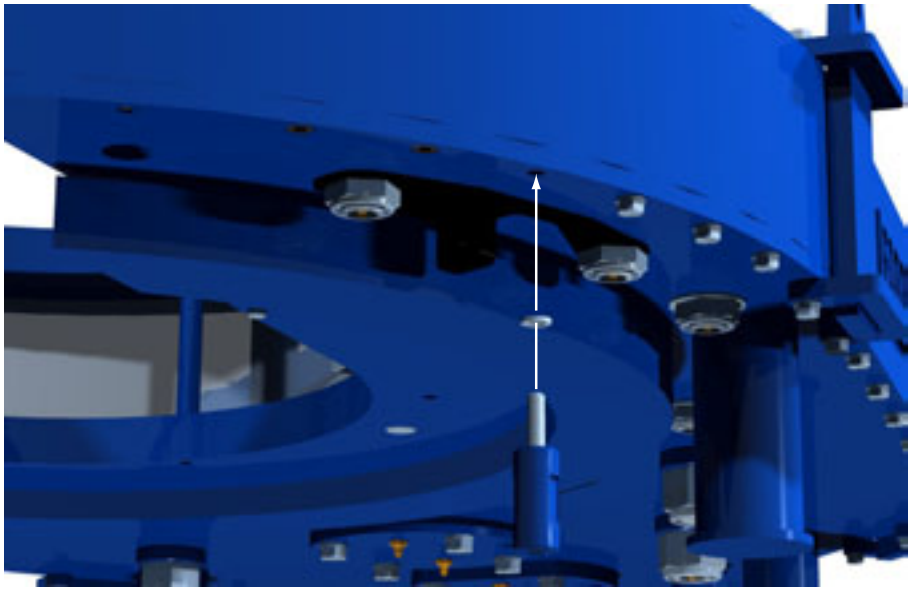


Illustration 3.H.10: Door Cylinder Post Installation

DRILLING & COMPLETIONS | FARR
MCCOY MOVING GLOBAL ENERGY FORWARD

Assembly Procedures (Cont'd):

44. *Thread two 1/2" UNC x 1-1/4" hex socket head set screws into each door assembly. Thread far enough through the door weldments that a 1/2" jam nut can be threaded on to each set screw from the inside of the door assemblies.*
45. *Slide a 1-1/8" plain washer on to each door pivot roller shaft (PN 101-3940). Position the RH door assembly in its proper location, and insert a door pivot shaft from the top through the door assembly and the support roller components. Secure the door pivot shaft on the bottom using a 1" flatwasher and 1" UNS thin nylock nut. Repeat the installation procedure for the LH door assembly.*
46. *Install the door stop cylinders (PN 1037-A4-144) using 1/2" UNC x 1-1/4" hex bolts, 1/2" narrow flatwashers, and 1/2" lockwashers. Do not neglect to install a door stop spacer (PN 1037-A4-145) through the end of each cylinder.*
47. *Install top and bottom lined brakeband weldments. Fasten each brakeband weldment to the top and bottom body plates with two brakeband retainers (PN 101-1631), securing each retainer with two 3/8" NC x 1" hex bolts and 3/8" lockwashers. Fasten the ends of the brakebands to the brakeband lug weldments using two 3/8" NC x 4-1/2" adjustment bolts and 3/8" NC hex nylock nuts per brakeband, one per side. Ensure that the adjustment spring (PN 08-9264) is installed between the head of the adjustment bolt and the tab on the brakeband weldment (four locations - see Pp. 5.22-5.23).*
48. *Install the two safety door valve mounting base-plates (PN 101-1707) on the top plate of the tong directly adjacent to each top brakeband lug weldment using two 3/8" UNC x 4" hex bolts and 3/8" lockwashers.*
49. *Attach the safety door valves (PN 08-0121) to the valve mount plates and the valve mount baseplates using one 5/16" UNC x 2-1/4" hex bolt, one 5/16" UNC x 3-1/4" hex bolt, and two 5/16" lockwashers per valve. Further secure the valve mount plate to the baseplate with a 5/16" UNC x 2" hex bolt and 5/16" lockwasher.*

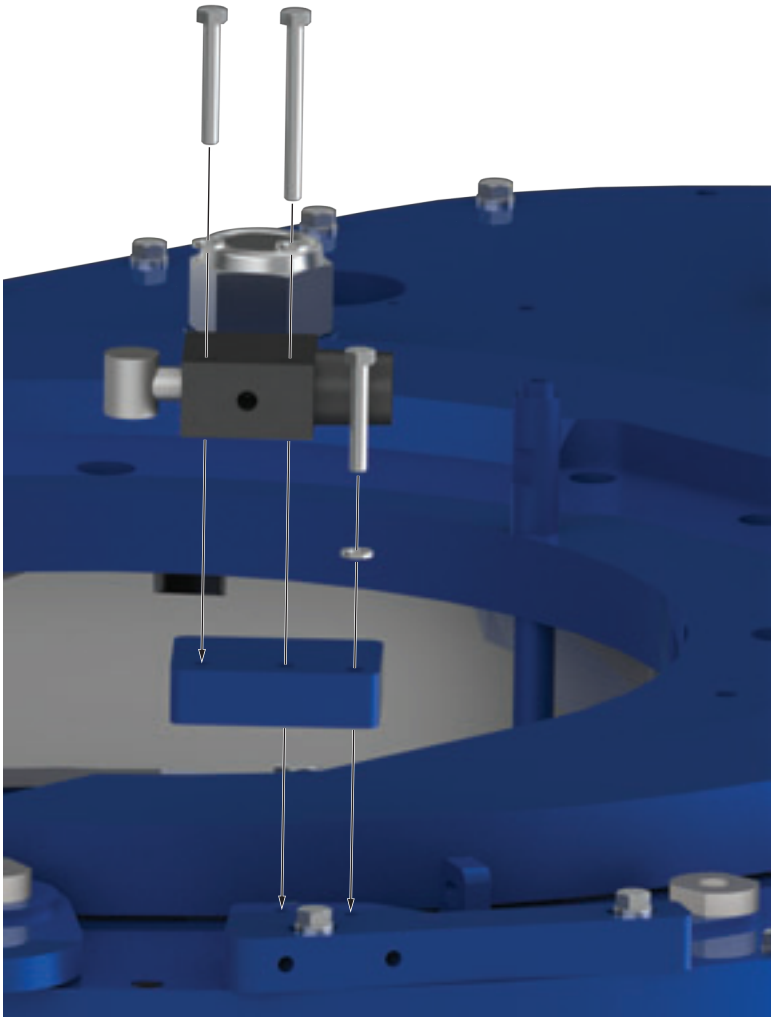


Illustration 3.H.11: Safety Door Valve Installation

50. *Thread a 1/4" straight thread grease fitting (PN 02-0097) into the top of each door pivot roller shaft.*
51. *Mount the safety door cam weldments (PN 101-1705) to each door weldment using two 3/8" UNC x 1" hex bolts and 3/8" lockwashers per weldment.*

DRILLING & COMPLETIONS | FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Assembly Procedures (Cont'd):

52. *Install the safety door valve guards (PN 101-0839). Mount the guards to the safety door valve mount baseplates using two 3/8" UNC x 1" hex bolts and 3/8" lockwashers.*
53. *Attach four leg weldments (PN 997-D8-160A) to the bottom plate of the tong using 7/8" UNC x 1-1/2" hex bolts and 7/8" plain narrow flatwashers.*
54. *Attach the hydraulic supports to the top plate:*
    - *i Attach the hydraulic valve mount weldments (PN 101-1442) to the top plate near the LH rotary idler, using one 3/8" UNC x 1" hex bolt and 3/8" lockwasher per mount.*
    - *ii Attach the hydraulic line support baseplate weldment (PN 101-1943) to the top plate directly behind the RH pinion idler using two 3/8" UNC x 1" hex bolts and 3/8" lockwashers.*
    - *iii. Attach the coupling support plate (PN 101-1946) to the hydraulic support baseplate using two 3/8" UNC x 1" hex bolts, two 3/8" narrow washers, and two 3/8" UNC thin nylock nuts.*
    - *iv. Attach the dump valve/coupling support weldment (PN 101-4850) to the top plate using two 3/8" NC x 1" hex bolts and 3/8" lockwashers.*
    - *v. Attach the adjustable coupling support plate (101-1775) to the dump valve/coupling support weldment using four 3/8" UNC x 1" hex bolts, four 3/8" narrow washers, and four 3/8" UNC thin nylock nuts.*
55. *Attach torque gauge holder weldment (PN 101-1694) to the rear of the top plate behind the motor mount using two 3/8" NC x 1" hex bolts and 3/8"lockwashers. Slide the torque gauge mount weldment (PN 101-2865) on to the holder weldment and secure with a 0.148" x 3" hitch pin.*
56. *Bolt the hydraulic valve assembly to the hydraulic valve support posts installed in step 54(i) using two 1/2" NC x 4-1/2" hex bolts and 1/2" lockwashers. Secure the inlet and outlet plumbing to the support assemblies installed in Step 54.*
57. *Install tong hangers:*
    - *i Attach four tong hanger bracket weldments (PN 101-3985) to the bottom plate using 3/8" NC x 2-1/2" hex bolts and 3/8" lockwashers (2 each per weldment).*
    - *ii Attach four tong hanger bracket bases (PN 101-4006) to the top plate using 3/8" NC x 2-1/2" hex bolts and 3/8" lockwashers (2 each per base).*
58. *Attach the chain sling to the four chain sling hangers using one shackle and bolt set (PN 02-9063) per hanger.*

DO NOT EXCEED THE SPECIFIED LENGTH OF ANY FASTENER (BOLTS, NUTS, CAP SCREWS, MACHINE SCREWS, ETC.).

REPLACEMENT FASTENER (BOLTS, NUTS, CAP SCREWS, MACHINE SCREWS, ETC.) USED DURING MAINTENANCE OR OVERHAUL MUST BE GRADE 8 OR EQUIVALENT UNLESS OTHERWISE SPECIFIED.

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

I. DAILY INSPECTION & MAINTENANCE CHECKLIST (POWER TONG)

Farr recommends that the following inspection and maintenance procedures be performed before each use, and at least once per day when the tong is in steady use, in the order in which they are listed.

1. ☐ *Rotate cageplate/rotary gear until the opening in the rotary gear faces towards the rear of the tong.*

DO NOT PERFORM ANY FURTHER ACTIONS OR MAINTENANCE WHILE THE TONG IS CONNECTED TO ANY HYDRAULIC POWER SUPPLY. FARR RECOMMENDS THAT ALL HYDRAULIC LINES ARE FULLY DISCONNECTED, AND RESIDUAL HYDRAULIC PRESSURE IS BLED OFF. ENSURE ADEQUATE CONTAINMENT IS IN PLACE TO PREVENT ENVIRONMENTAL CONTAMINATION FROM RESIDUAL HYDRAULIC FLUID.

2. ☐ ***Depressurize Hydraulic System In Preparation For Maintenance:***

1) *Rotate the tong to the "open throat" position. Ensure tong and backup doors (if equipped) are closed. Fully extend the lift cylinder*
2) *De-energize the power unit.*
3) *Repeatedly actuate the tong motor control valve lever IN BOTH DIRECTIONS to dissipate any residual pressure in the valve and motor.*
4) *Remove the hydraulic SUPPLY line from the equipment.*
5) *Repeatedly actuate the remaining control valve levers IN BOTH DIRECTIONS to dissipate any residual pressure in the remainder of the hydraulic control system.*
7) *Disconnect the hydraulic RETURN line from the equipment.*
8) *Disconnect remaining hoses such as case drains, or lines connected to the turns counter.*

HYDRAULIC PRESSURES AS HIGH AS OPERATING PRESSURE MAY REMAIN TRAPPED IN SMALL AREAS OF THE EQUIPMENT. ENSURE ALL MAINTENANCE IS CARRIED OUT BY A QUALIFIED SERVICE TECHNICICAN, AND THAT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT IS USED TO GUARD AGAINST PRESSURE INJURIES

3. ☐ *Perform an initial wash of the tong in order to remove the majority of dirt and grease build-up. Ensure adequate containment is in place to prevent environmental contamination from residual hydraulic fluid and dirty grease.*

4. ☐ *Remove the access panel on the side of the tong directly adjacent to the shifter mechanism.*

5. ☐ *Use a flashlight to perform a visual inspection of the geartrain through the access panel and the opening of the rotary gear. If gear damage or chips of metal are seen, the tong should be removed from service and overhauled to avoid further damage. Replace access panel when inspection is complete.*

6. ☐ *Perform a visual inspection of all fasteners and protruding body pieces (example: hydraulic valve mounts, inlet & outlet line supports, tong legs, shifter handle pivot lugs). Tighten or replace loose or missing fasteners. Farr recommends that damaged or missing body parts br repaired or replaced as soon as possible.*

7. ☐ *Inspect the jaws and dies. Inspect the jaw roller pins for signs of damage - replace pins if necessary. If the pins are welded in place, replace the entire jaw assembly. Ensure dies are secure in the jaw - replace worn dies if necessary. Ensure that the jaw rollers rotate freely. Check to ensure the size of the loaded jaws match the size of casing or pipe you are running.*

8. ☐ *Perform a visual inspection of all lifting points - if visible damage is seen, including cracks, broken lugs, distorted metal, etc. replace damaged part(s) before placing tong in service. Also inspect all chains, master links, and turnbuckles - again, if any damage is noted replace the damaged part(s) before placing the tong in service.*

9. ☐ *Inspect tong for signs of premature wear, or moving parts that are rubbing (bare metal where there used to be paint is a good indication of wear.*

10. ☐ *Inspect backing pin(s). If cracked, broken, or bent it (they) must be replaced.*

11. ☐ *Inspect top and bottom brakeband linings - replace if necessary. Unequal wear of the brakebands indicates that the brakeband tension is not evenly adjusted. Refer to the maintenance section of the manual for instructions on properly adjusting brakebands.*

12. ☐ *Perform a visual inspection of all hydraulic lines. Replace flexible lines if they appear to be cracked, fatigued, or have visible signs of wear from contact with a rigid object.*

DRILLING & COMPLETIONS | FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

13. ☐ *Perform a visual inspection of all hydraulic lines. Replace flexible lines if they appear to be cracked, fatigued, or have visible signs of wear from contact with a rigid object.*

14. ☐ *Perform a complete greasing of the tong - refer to Maintenance section of the technical manual*

15. ☐ *Ensure main supply and return connections to the tong are fully made up. Re-connect the remainder of the hydraulic lines, and, if applicable, the electrical line to the turns counter.*

FAILURE TO ENSURE THAT THE SELF-SEALING SUPPLY AND RETURN LINES ARE FULLY MADE UP MAY RESULT IN CATASTROPHIC EQUIPMENT FAILURE.

If using a stand-alone power unit, start it now - refer to the power unit technical manual for startup procedures. Listen to power unit for a moment to see if there are any unusual mechanical sounds (rubbing, grinding, excessive pump noise). If using a diesel unit, allow sufficient time for the engine to reach operating temperature before increasing engine RPM. Once engine is warm, gradually increase engine RPM until operating speed is reached.

16. ☐ *Ensure that supply pressure is at or above the tong's specified operating pressure, and that the return pressure is less than 350 psi.*

17. ☐ *Perform a visual inspection of pressurized hydraulic lines. Document and correct any hydraulic fluid leaks.*

18. ☐ *Perform a full functional test of the tong. Report and correct any hydraulic leaks from the hydraulic valve bank, or from any hydraulic cylinders that are used.*

19. ☐ *Perform a visual inspection of the load cell. If using a tension load cell, replace any cracked, broken, or distorted components including links and chains. If using a compression load cell, replace any component that has been crushed or otherwise distorted through compression.*

20. ☐ *If applicable, inspect the load cell anchor pins (tension load cell only). Replace the anchor pins if cracking or metal distortion is seen.*

21. ☐ *If applicable, the weld securing the single load cell anchor to the bridge bar main plate must be inspected (compression load cell only). If the integrity of the weld has been compromised, the tong must be removed from service until the weld is repaired. The load cell beam will need to be disconnected and removed so the weld is visible. Before re-installing the beam, liberally grease the anchor pin before reinserting into the load cell beam.*

22. ☐ *Test safety door feature (if equipped). Open the tong door(s), and attempt to rotate the cageplate at low speed (low gear) in both directions (makeup and breakout). If cageplate begins rotating, the safety door mechanism is not functional, and the tong must be removed from service until the safety door mechanism can be repaired. If the safety door is operating correctly, cageplate rotation will not be inhibited once the door is closed and latched.*

NEVER OPERATE YOUR EQUIPMENT WITH A BYPASSED OR MALFUNCTIONING SAFETY DOOR

23. ☐ *While rotating the cageplate, ensure that the jaws properly cam. If the jaws do not cam properly, the brakebands need to be tightened. Incrementally adjust both the top and bottom brakebands EQUALLY until proper cam action is achieved.*

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

J. MONTHLY MAINTENANCE CHECKLIST - POWER TONG

The following maintenance checklist is intended as a guideline rather than a definitive maintenance schedule. Your equipment may require more, or less, maintenance depending upon the frequency of use, the percentage of maximum torque that your equipment is routinely subjected to, and the field conditions under which your equipment operates. Farr recommends that the following inspection and maintenance procedures be performed monthly, or in conjuction with your maintenance foreman's experience and best estimate of when your equipment is due for this maintenance.

1. ☐ *Rotate cageplate/rotary gear until the opening in the rotary gear faces towards the rear of the tong.*

DO NOT PERFORM ANY FURTHER ACTIONS OR MAINTENANCE WHILE THE TONG IS CONNECTED TO ANY HYDRAULIC POWER SUPPLY. FARR RECOMMENDS THAT ALL HYDRAULIC LINES ARE FULLY DISCONNECTED, AND RESIDUAL HYDRAULIC PRESSURE IS BLED OFF. ENSURE ADEQUATE CONTAINMENT IS IN PLACE TO PREVENT ENVIRONMENTAL CONTAMINATION FROM RESIDUAL HYDRAULIC FLUID.

Depressurize Hydraulic System In Preparation For Maintenance:

2. ☐
   1) *Rotate the tong to the "open throat" position. Ensure tong and backup doors (if equipped) are closed. Fully extend the lift cylinder*
   2) *De-energize the power unit.*
   3) *Repeatedly actuate the tong motor control valve lever IN BOTH DIRECTIONS to dissipate any residual pressure in the valve and motor.*
   4) *Remove the hydraulic SUPPLY line from the equipment.*
   5) *Repeatedly actuate the remaining control valve levers IN BOTH DIRECTIONS to dissipate any residual pressure in the remainder of the hydraulic control system.*
   7) *Disconnect the hydraulic RETURN line from the equipment.*
   8) *Disconnect remaining hoses such as case drains, or lines connected to the turns counter.*

HYDRAULIC PRESSURES AS HIGH AS OPERATING PRESSURE MAY REMAIN TRAPPED IN SMALL AREAS OF THE EQUIPMENT. ENSURE ALL MAINTENANCE IS CARRIED OUT BY A QUALIFIED SERVICE TECHNICICAN, AND THAT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT IS USED TO GUARD AGAINST PRESSURE INJURIES

3. ☐ *Clean the exterior of the tool thoroughly, using either water (if using a pressure washer ensure a low-pressure wash wand is used), or an appropriate solvent-based grease-cutting cleaner such as Varsol. Ensure adequate containment is in place to prevent environmental contamination from residual hydraulic fluid, dirty grease, and cleaning agents.*

4. ☐ *Remove the access panel on the side of the tong directly adjacent to the shifter mechanism.*

5. ☐ *Clean the interior of the tong thoroughly, using either water (do not use a pressure washer), or an appropriate solvent-based grease-cutting cleaner such as Varsol. Ensure adequate containment is in place to prevent environmental contamination from residual hydraulic fluid, dirty grease, and cleaning agents. Make a note if any metal shavings or metal pieces are flushed out of the geartrain cavity - if shavings or metal pieces are seen the tong must be overhauled before it is returned to service.*

6. ☐ *Inspect all fasteners and fastener safety wires (if equipped). Replace any missing fasteners - use Grade 8 bolts only unless otherwise specified. Re-torque all external fasteners to SAE specifications.*

7. ☐ *Repair or replace any damaged or missing external body parts, such as torque gauge mounts, hydraulic supports, safety door protectors, etc.*

8. ☐ *Perform a visual inspection of all fasteners and protruding body pieces (example: hydraulic valve mounts, inlet & outlet line supports, tong legs, shifter handle pivot lugs). Tighten or replace loose or missing fasteners. Farr recommends that damaged or missing body parts be repaired or replaced as soon as possible.*

9. ☐ *Inspect tong for signs of premature wear, or moving parts that are rubbing (bare metal where there used to be paint is a good indication of wear.*

10. ☐ *Inspect all paint - locations in which the paint has been damaged must be repaired prior to the tong being returned to service. Prepare areas to be painted to ensure they are free of grease, dirt, or solvent. Touch up using a solvent-based acrylic paint - "Farr Blue" is paint number RAL5005 (contact Farr sales for paint number for custom paint applications). Allow sufficient time for paint to dry before proceeding.*

11. ☐ *Inspect all external welds. Any weld that is cracked or separating must be repaired and repainted before returning the tong to service.*

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

12. ☐ *Perform a visual inspection of all lifting points - if visible damage is seen, including cracks, broken lugs, distorted metal, etc. replace damaged part(s) before placing tong in service. Also inspect all chains, master links, and turnbuckles - again, if any damage is noted replace the damaged part(s) before placing the tong in service. Refer to Section 2A of the technical manual (Sling/Load Bearing Device Safety) for information on recommended testing and recertification. Please note that turnbuckles with part number 101-3086 (short turnbuckles) use a high-strength pin which must be supplied by Farr.*

"SHORT" TURNBUCKLES HAVING PART NUMBER 101-3086 EMPLOY HIGH-STRENGTH PINS WHICH MUST BE SUPPLIED BY FARR.

13. ☐ *Rotate the geartrain by hand, and use a flashlight to perform a visual inspection of the geartrain through the access panel and the opening of the rotary gear while the geartrain is being rotated. If gear damage or chips of metal are seen, the tong should be removed from service and overhauled to avoid further damage. Replace access panel when inspection is complete.*

14. ☐ *Inspect all jaws and dies in use for the maintenance interval. Inspect the jaw roller pins for signs of damage - replace pins if necessary. If the pins are welded in place, remove and quarantine the jaw until the weld is repaired. Ensure dies are secure in the jaw - replace worn dies if necessary. Ensure that the jaw rollers rotate freely.*

15. ☐ *Inspect backing pin(s). If cracked, broken, or bent it (they) must be replaced.*

16. ☐ *Inspect top and bottom brakeband linings - replace if necessary. Unequal wear of the brakebands indicates that the brakeband tension is not evenly adjusted. Refer to the maintenance section of the manual for instructions on properly adjusting brakebands.*

17. ☐ *Inspect door springs. Ensure the springs retain sufficient strength to be able to assist the opening of the door, and to keep the door open. The springs should also help to "snap" the door shut.*

18. ☐ *Inspect backup springs (if applicable). The rear extension springs should be equally extended, and the front leg springs should be equally compressed. Ensure that neither of the rear backup springs have been over-extended and lack sufficient tension to adequately support the backup. Ensure that neither of the front leg springs have been over-compressed, and still retain enough spring strength to support the front of the backup.*

19. ☐ *Extend all hydraulic cylinders, and inspect cylinder rods for signs of mechanical damage, flaking, or rust. Farr recommends that damaged cylinders be replaced prior to storage.*

20. ☐ *Perform a visual inspection of all hydraulic lines. Replace flexible lines if they appear to be cracked, fatigued, or have visible signs of wear from contact with a rigid object. If your tong is equipped with rigid hydraulic lines, replace any line that is dented or appears to be stressed or cracked.*

21. ☐ *Generously fill the geartrain housing with grease through the access panel, and also through the opening in the rotary gear. Perform a full lubrication - refer to Maintenance section of manual to determine lubrication points.*

22. ☐ *Ensure main supply and return connections to the tong are fully made up. Re-connect the remainder of the hydraulic lines, and, if applicable, the electrical line to the turns counter.*

FAILURE TO ENSURE THAT THE SELF-SEALING SUPPLY AND RETURN LINES ARE FULLY MADE UP MAY RESULT IN CATASTROPHIC EQUIPMENT FAILURE.

If using a stand-alone power unit, start it now - refer to the power unit technical manual for startup procedures. Listen to power unit for a moment to see if there are any unusual mechanical sounds (rubbing, grinding, excessive pump noise). If using a diesel unit, allow sufficient time for the engine to reach operating temperature before increasing engine RPM. Once engine is warm, gradually increase engine RPM until operating speed is reached.

23. ☐ *Ensure that supply pressure is at or above the tong's specified operating pressure, and that the return pressure is less than 350 psi.*

24. ☐ *Perform a visual inspection of pressurized hydraulic lines. If any hydraulic fittings or hoses are leaking they must be repaired or replaced before proceeding.*

25. ☐ *Rotate tong for one minute, stop, and reverse the direction of rotation for another minute, ending with the opening of the rotary gear facing the geartrain. De-energize the power unit, and perform another generous lubrication of the geartrain, including the gear housing.*

26. ☐ *Energize power unit. Rotate tong for one minute, stop, and reverse the direction of rotation for another minute, ending with the opening of the rotary gear facing the geartrain.*

27. ☐ *De-energize the power unit, and perform a third generous lubrication of the geartrain, including the gear housing.*

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

28. ☐ *Re-energize power unit and extend all hydraulic cylinders. Inspect cylinder rods for signs of mechanical damage, flaking, or rust. Farr recommends that damaged cylinders be replaced.*

29. ☐ *Rotate tong in low gear for 5 minutes while monitoring pressurized seals and hydraulic lines. If a seal, line, or fitting begins to leak while tong is rotating, it must be replaced before the equipment is returned to service.*

30. ☐ *Rotate tong in high gear for 5 minutes while monitoring temperature of top and bottom bearing caps. If the bearing caps are hot to the touch (higher than approximately 50°C) replace the applicable bearings. Likewise if the tong is making unusual noises check for damaged bearings (see Maintenance Manual for all bearing locations).*

31. ☐ *Install load cell. If using a tension load cell, perform a visual inspection and replace any cracked, broken, or distorted components including links and chains. If using a compression load cell, replace any component that has been crushed or otherwise distorted through compression.*

32. ☐ *If applicable, inspect the load cell anchor pins (tension load cell only). Replace the anchor pins if cracking or metal distortion is seen.*

33. ☐ *If applicable, the weld securing the single load cell anchor to the bridge bar main plate must be inspected (compression load cell only). If the integrity of the weld has been compromised, the tong must be removed from service until the weld is repaired. The load cell beam will need to be disconnected and removed so the weld is visible. Before re-installing the beam, liberally grease the anchor pin before reinserting into the load cell beam.*

34. ☐ *Inspect load cell for damage or signs of stress. Check oil level in load cell and fill if necessary (refer to technical manual Section 7 or Section 8).*

35. ☐ *While rotating the cageplate, ensure that the jaws properly cam. If the jaws do not cam properly, the brakebands need to be tightened. Incrementally adjust both the top and bottom brakebands EQUALLY until proper cam action is achieved. Refer to the maintenance section of the manual for instructions on properly adjusting brakebands.*

36. ☐ *Perform a full functional test of the tong including, if applicable, backup components, lift cylinder, and float frame components. Report and correct any hydraulic leaks from the hydraulic valve bank, or from any hydraulic cylinders that are used.*

37. ☐ *Test safety door feature (if equipped). Begin rotating the tong at low speed, and open the tong door(s). If rotation does not immediately stop, this is an indication that the safety door mechanism is not operaing correctly and the tong must be removed from service until the mechanism is repaired. Repeat the test while operating the tong in the opposite direction. If the safety door is operating correctly, cageplate rotation will not be inhibited once the door is closed and latched.*

NEVER OPERATE YOUR EQUIPMENT WITH A BYPASSED OR MALFUNCTIONING SAFETY DOOR

38. ☐ *Farr recommends that an anti-corrosive agent such as Tectyl® 506 be applied to all external unpainted surfaces (and chain slings) EXCEPT cylinder rods, jaw rollers, and rotary gear camming surfaces. Refer to manufacturer data sheets for proper application and safety information.*

Once all of the above maintenance checklist items have been satisfactorily completed the tool may be returned to service.

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

K. DAILY INSPECTION & MAINTENANCE CHECKLIST (POWER UNIT)

Farr recommends that the following inspections and maintenance procedures be performed before each use, and at least once per day when the equipment is in steady use, in the sequence in which they are listed. Rigorous inspection and mainentance, especially lubrication, is essential in order to ensure that your equipment always meets specifications, and to prevent catastrophic failures that can severely damage your equipment and cause worker injury.

If using a stand-alone power unit, perform the following inspection and maintenance procedures before each use, and at least once per day when the power unit is in steady use:

Do not perform any maintenance while the power unit is energized (electric) or if the engine is running (diesel). Ensure the electrical supply is locked out, or, if using a diesel power supply, ensure that the engine is locked out or the starting mechanisn otherwise disabled.

DIESEL ONLY

1. ☐ *Check engine oil levels - add if necessary*
2. ☐ *Check diesel fuel tank - fill if necessary.*
3. ☐ *Visually inspect all fan belts.*
4. ☐ *Activate mechanical shut-off device - ensure that shut-off switch on engine is engaging when manual shut-off switch is actuated.*

ELECTRIC ONLY

1. ☐ *Visually inspect all electrical lines and visible connections. If your unit is NOT explosion proof, open the electrical enclosure and VISUALLY inspect contacts and connections for signs of corrosion or arcing. Do not open explosion-proof enclosures.*

NEVER PLACE HANDS INSIDE AN ELECTRICAL ENCLOSURE UNLESS YOU HAVE CONFIRMED THAT THE POWER HAS BEEN DISCONNECTED AND LOCKED OUT

2. ☐ *Visually inspect main electrical line between main power source and power unit.*

ALL UNITS

5. ☐ *Perform a visual inspection of all parts. Check to ensure there are no loose or missing fasteners.*
6. ☐ *Check hydraulic fluid level - ensure cold level is approximately half-way up the sight glass on the hydraulic fluid reservoir.*
7. ☐ *Perform a visual inspection to ensure there are no hydraulic fluid leaks - correct if necessary.*
8. ☐ *Check that the main supply and return lines on the hydraulic fluid reservoir are both fully open.*
9. ☐ *Apply grease to any grease fittings that your power unit may have. Apply grease to each fitting until grease is visibly displaced from bearing, or as recommended by your power unit manual.*
10. ☐ *Ensure supply and return connections at the power unit and at the equipment in use are fully made up.*

FAILURE TO ENSURE THAT THE SELF-SEALING SUPPLY AND RETURN LINES ARE FULLY MADE UP MAY RESULT IN CATASTROPHIC EQUIPMENT FAILURE.

11. ☐ *Check hydraulic fluid filter back pressure (must be done while fluid is circulating). If needle on indicator gauge is in the red zone, the filter should be changed the next time the unit is shut down*

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

L. TUBULAR CONNECTION EQUIPMENT DE-COMMISSIONING PROCEDURE

Perform the following decommisioning procedures when removing tubular connection equipment from service, with the intent of short to long-term storage. These procedures are essential for ensuring proper protection of the equipment from environmental attack, and to aid in the quick turnaround when returning the equipment to service.

Store all o-rings, seals, packings, gaskets, etc. in strong moisture proof, airtight containers. Ensure that these items are not crushed, nicked, or otherwise damaged.

Do not perform any further actions or maintenance while the tong is connected to any hydraulic power supply. Farr recommends that all hydraulic lines are fully disconnected, and residual hydraulic pressure is bled off. Ensure adequate containment is in place to prevent environmental contamination from residual hydraulic fluid.

DEPRESSURIZATION PROCEDURE IN PREPARATION FOR STORAGE:

1) *Rotate the tong so that the opening in the rotary gear faces the geartrain (towards the rear of the tong). Ensure tong and backup doors (if equipped) are closed. Fully extend the lift cylinder (if equipped). If mounted in a frame, retract the float cylinders (if equipped).*
2) *De-energize the power unit.*
3) *Repeatedly actuate the tong motor control valve lever IN BOTH DIRECTIONS to dissipate any residual pressure in the valve and motor.*
4) *Remove the hydraulic SUPPLY line from the equipment.*
5) *Repeatedly actuate the remaining control valve levers IN BOTH DIRECTIONS to dissipate any residual pressure in the remainder of the hydraulic control system.*
7) *Disconnect the hydraulic RETURN line from the equipment.*
8) *Disconnect remaining hoses such as case drains, or lines connected to the turns counter.*

HYDRAULIC PRESSURES AS HIGH AS OPERATING PRESSURE MAY REMAIN TRAPPED IN SMALL AREAS OF THE EQUIPMENT. ENSURE ALL MAINTENANCE IS CARRIED OUT BY A QUALIFIED SERVICE TECHNICICAN, AND THAT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT IS USED TO GUARD AGAINST PRESSURE INJURIES

1. ☐ *Perform an initial wash of the tool in order to remove the majority of dirt and grease build-up. Ensure adequate containment is in place to prevent environmental contamination from residual hydraulic fluid and dirty grease.*
2. ☐ *Remove the access panel on the side of the tong directly adjacent to the shifter mechanism.*
3. ☐ *Clean the interior of the tong thoroughly, using either water (do not use a pressure washer), or an appropriate solvent-based grease-cutting cleaner such as Varsol. Ensure adequate containment is in place to prevent environmental contamination from residual hydraulic fluid, dirty grease, and cleaning agents. Make a note if any metal shavings or metal pieces are flushed out of the geartrain cavity - if shavings or metal pieces are seen the tong must be overhauled before it is returned to service.*
4. ☐ *Clean the exterior of the tool thoroughly, using either water (do not use a pressure washer), or an appropriate solvent-based grease-cutting cleaner such as Varsol. Ensure adequate containment is in place to prevent environmental contamination from residual hydraulic fluid, dirty grease, and cleaning agents.*
5. ☐ *Inspect all fasteners and fastener safety wires. Replace any missing fasteners - use Grade 8 bolts only. Re-torque all external fasteners to SAE specifications.*
6. ☐ *Inspect backing pin(s). If cracked, broken, or bent it (they) must be replaced.*
7. ☐ *Repair or replace any damaged or missing external body parts, such as torque gauge mounts, hydraulic supports, safety door protectors, etc.*
8. ☐ *Inspect all paint - locations in which the paint has been damaged must be repaired prior to storage. Prepare areas to be painted to ensure they are free of grease, dirt, or solvent. Touch up using a solvent-based acrylic paint - "Farr Blue" is paint number RAL.5005. Allow sufficient time for paint to dry before proceeding.*
9. ☐ *Perform a liberal lubrication of the equipment - refer to Maintenance section of manual to determine lubrication points. Generously fill the geartrain housing with grease through the access panel, and also through the opening in the rotary gear.*
10. ☐ *Connect the equipment to a hydraulic power unit. Ensure all lines are fully made up to prevent equipment damage from excessive back pressure. Do not neglect to connect the motor drain.*
11. ☐ *Energize power unit.*
12. ☐ *Rotate tong for one minute, stop, and reverse the direction of rotation for another minute, ending with the opening of the rotary gear facing the geartrain. De-energize the power unit, and perform another generous lubrication of the geartrain, including the gear housing.*

MCCOY DRILLING & COMPLETIONS | FARR
MOVING GLOBAL ENERGY FORWARD

13. ☐ *Energize power unit. Rotate tong for one minute, stop, and reverse the direction of rotation for another minute, ending with the opening of the rotary gear facing the geartrain.*

14. ☐ *De-energize the power unit, and perform a third generous lubrication of the geartrain, including the gear housing.*

15. ☐ *Energize power unit, and rotate the tong for a final time, one minute in one direction, stop, and reverse the direction of rotation for another minute, this time ending with the rotary gear in the "open throat" position.*

16. ☐ *Extend all hydraulic cylinders, and inspect cylinder rods for signs of mechanical damage, flaking, or rust. Farr recommends that damaged cylinders be replaced prior to storage.*

17. ☐ *If you are using a frame-mounted tool, the tong must be lowered onto the backup in order to remove the risk of sudden and catastrophic movement when pressure is removed from the float cylinders. Cover the top of the backup with protective cloth to protect the paint on the backup. Place two wooden beams across the top of the tong, ensuring that the beams have a minimum size of 4" x 4" x the width of the tong. Cover the tops of the wooden beams with more protective cloth to prevent paint damage to the tong. When lowering the tong onto the beams, ensure that the beams come into flat contact with the bottom of the tong, away from bearing caps, brakebands, or other protrusions on the bottom of the tong. Ensure that the tong hanger chains are loose, but not dangling into contact with the hangers or top plate of the tong.*

DEPRESSURIZATION PROCEDURE FOR STORAGE:

1) *Rotate the tong to the "open throat" position.*
2) *Exercise each hydraulic cylinder several times - open the tong and backup doors (if equipped), retract and extend the remote backing pin ramp (if equipped), retract and extend the float cylinders. Leave all cylinders except for the door cylinders in their fully retracted position. The general idea is to have as little of the chrome cylinder rods exposed as possible.*
3) *De-energize the power unit.*
4) *Repeatedly actuate the tong motor control valve lever IN BOTH DIRECTIONS to dissipate any residual pressure in the valve and motor.*
5) *Remove the hydraulic SUPPLY line from the equipment.*
6) *Repeatedly actuate the remaining control valve levers IN BOTH DIRECTIONS to dissipate any residual pressure in the remainder of the hydraulic control system.*
7) *Connect a low-pressure air supply line (10 PSI or less) to the hydraulic supply line, and force a small amount of the remaining hydraulic fluid from the valve assembly - this will allow for thermal expansion of the hydraulic fluid if the equipment is stored or transported in high ambient temperatures. Failure to do this may result in damaged or destroyed seals in the equipment.*
8) *Disconnect the hydraulic RETURN line from the equipment.*
9) *Disconnect remaining hoses such as case drains, or lines connected to the turns counter.*

18. ☐ *If any hydraulic fittings or hoses are leaking they must be repaired or replaced before proceeding.*

19. ☐ *Wipe all excess grease from outside of equipment. Replace the access door panel. Use a solvent-based cleaner on rags to wipe all external surfaces to remove residual grease or hydraulic fluid. Once the outside surfaces have been de-greased, wipe all external surfaces with clean water to remove residual solvent.*

20. ☐ *Farr recommends that chain slings be removed and stored separately. Rigid slings and other rigid suspension devices may remain in place.*

21. ☐ *Apply grease or heavy oil to all exposed cylinder rods.*

22. ☐ *Farr recommends that an anti-corrosive agent such as Tectyl® 506 be applied to all external surfaces EXCEPT cylinder rods (including chain slings). Refer to manufacturer data sheets for proper application and safety information.*

DO NOT ALLOW ANTI-CORROSIVE AGENTS TO CONTACT CYLINDER RODS.CYLINDER ROD DAMAGE WILL OCCUR.

23. ☐ *Allow the anti-corrosive coating ample time to dry - refer to manufacturer data sheets for drying times at room temperature.*

24. ☐ *Wrap entire assembly in 100 gauge (1 mil) corrosion-inhibiting wrap, at least 3 layers thick. Attempt to ensure that the tool is well-sealed within the wrapping, including the bottom.*

DRILLING & COMPLETIONS | FARR
MCCOY MOVING GLOBAL ENERGY FORWARD

If possible, store in a sealed, climate controlled environment. If isolated storage is not available, Farr recommends storing your wrapped equipment in a secure, out-of-the-way location, using silica gel desiccant to reduce the humidity within the wrapping. As a guideline, use 125 g. of desiccant for each cubic metre of space, or 3.5 g. per cubic foot.

Calculation Of Required Desiccant

1) Calculate the trapped air volume by measuring the outside dimensions of the tool to be stored, and treat that as the volume to be stored. For example, the external dimensions of a KT20000 20" power tong are 80.25" x 50.5" x 28", which calculates to an approximate volume of 113500 in^3, or 66 ft^3 (1.87 m^3).

2) Multiply the calculated air volume, in cubic feet, by the recommended amount of desiccant per cubic foot. Carrying forth the example used in the previous step, the required desiccant charge would be 3.5 g. x 66 ft^3, equaling 231 g. Several manufacturers offer silica gel desiccant in packaged quantities of 125 grams per bag, so two packages of desiccant would be required. Please keep in mind that this is a guideline only - more or less desiccant may be required in extreme environmental conditions.

For best corrosion resistance the equipment should be removed from storage and exercised on a regular basis, depending on the storage environment. Farr recommends that for equipment stored in a salt-water maritime or exposed dusty environment, repeat steps 9 through 24 monthly. For equipment stored in isolated storage in a non-maritime environment, repeat steps 9 through 24 quarterly. Replace desiccant packs at this time - depleted desiccant packs may be treated as regular dunnage.

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

M. TUBULAR CONNECTION EQUIPMENT RE-COMMISSIONING PROCEDURE

Perform the following re-commisioning procedures when removing tubular connection equipment from short or long-term storage back into regular service. These procedures are essential for ensuring proper equipment preparation and operation. The following procedures also assume that the decommissioning and storage procedures recommended by Farr have been strictly observed.

1. ☐ *Remove all protective plastic wrapping. If there are desiccant packs with the assembly, they may be disposed of with the regular garbage.*
2. ☐ *Remove the access panel on the side of the tong directly adjacent to the shifter mechanism.*
3. ☐ *Wipe excess grease or heavy oil from exposed cylinder rods.*
4. ☐ *If applicable, re-connect chain sling to lifing lugs. Perform a visual inspection of all lifting points - if visible damage is seen, including cracks, broken lugs, distorted metal, etc. replace damaged part(s) before placing tong in service. Also inspect all chains, master links, and turnbuckles - again, if any damage is noted replace the damaged part(s) before placing the tong in service. If your company requires yearly certification of lifting equipment, ensure that the most recent test date falls within the past year. Perform recertification if necessary.*
5. ☐ *Perform a liberal lubrication of the equipment - refer to Maintenance section of manual to determine lubrication points. Generously fill the geartrain housing with grease through the access panel, and also through the opening in the rotary gear.*
6. ☐ *Connect the equipment to a hydraulic power unit. Ensure all lines are fully made up to prevent equipment damage from excessive back pressure. Do not neglect to connect the motor drain.*

FAILURE TO ENSURE THAT THE SELF-SEALING SUPPLY AND RETURN LINES ARE FULLY MADE UP MAY RESULT IN CATASTROPHIC EQUIPMENT FAILURE.

7. ☐ *Energize power unit.*
8. ☐ *Ensure that supply pressure is at or above the tong's specified operating pressure, and that the return pressure is less than 350 psi.*
9. ☐ *Perform a thorough inspection of pressurized hydraulic lines and fittings. Any leaking hydraulic fluid lines or fittings must be replaced before the equipment is returned to service.*
10. ☐ *Perform a thorough inspection of all seals. Any seal that is leaking or "weeping" must be replaced before the equipment is returned to service.*
11. ☐ *Rotate tong in low gear for 5 minutes while monitoring pressurized seals and hydraulic lines. If a seal, line, or fitting begins to leak while tong is rotating, it must be replaced before the equipment is returned to service. Finish this step with the rotary gear opening facing the geartrain. De-energize the power unit.*
12. ☐ *Inspect all flexible hydraulic lines for signs of wear, blistering, or any other signs of potential failure - replace if signs of potential failure are identified.*
13. ☐ *Inspect the geartrain housing. If the amount of grease is inadequate, liberally grease the geartrain through the access panel, and through the opening in the rotary gear.*
14. ☐ *Inspect top and bottom brakeband linings - replace if necessary. Unequal wear of the brakebands indicates that the brakeband tension is not evenly adjusted. Refer to the maintenance section of the manual for instructions on properly adjusting brakebands. Ensure that all grease is wiped from brakeband linings and the parts of the cageplates that come into contact with the brakeband linings*
15. ☐ *Re-install access panel. Install a set of pre-inspected jaws that are the correct size for the pipe or casing being run.*
16. ☐ *Install load cell. If using a tension load cell, perform a visual inspection and replace any cracked, broken, or distorted components including links and chains. If using a compression load cell, replace any component that has been crushed or otherwise distorted through compression.*
17. ☐ *If applicable, inspect the load cell anchor pins (tension load cell only). Replace the anchor pins if cracking or metal distortion is seen.*
18. ☐ *If applicable, the weld securing the single load cell anchor to the bridge bar main plate must be inspected (compression load cell only). If the integrity of the weld has been compromised, the tong must be removed from service until the weld is repaired. The load cell beam will need to be disconnected and removed so the weld is visible. Before re-installing the beam, liberally grease the anchor pin before reinserting into the load cell beam.*
19. ☐ *Re-energize power unit.*

DRILLING & COMPLETIONS | FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

20. ☐ *Perform a full functional test of the equipment including, if applicable, backup components and float frame components. Report and correct any hydraulic leaks from the hydraulic valve bank, or from any hydraulic cylinders that are used.*

21. ☐ *If using a frame-mounted tong and backup system, raise the tong off the beams that it is resting upon. Remove the beams and protective cloths - inspect the paint on top of the backup and the bottom of the tong to ensure it has not been damaged by the beam.*

22. ☐ *Test safety door feature (if equipped). Open the tong door(s), and attempt to rotate the cageplate at low speed (low gear) in both directions (makeup and breakout). If cageplate begins rotating, the safety door mechanism is not functional, and the tong must be removed from service until the safety door mechanism can be repaired. If the safety door is operating correctly, cageplate rotation will not be inhibited once the door is closed and latched.*

NEVER OPERATE YOUR EQUIPMENT WITH A BYPASSED OR MALFUNCTIONING SAFETY DOOR

23. ☐ *While rotating the cageplate, ensure that the jaws properly cam. If the jaws do not cam properly, the brakebands need to be tightened. Incrementally adjust both the top and bottom brakebands EQUALLY until proper cam action is achieved.*

24. ☐ *When all of the previous steps are completed, you may return your re-commissioned equipment to service.*

MCCOY DRILLING & COMPLETIONS
MOVING GLOBAL ENERGY FORWARD
FARR

This page intentionally left blank

Adequate maintenance and proper fluid selection is essential for minimizing hydraulic-related failures. All troubleshooting must be performed by a technician trained in hydraulic systems, and familiar with the equipment design, assembly and operation.
The following troubleshooting instructions are intended to be guidelines only. Any faults not solved through the use of this guide should be referred to our engineering department for their evaluation and recommendations.

A. TONG WILL NOT DEVELOP SUFFICIENT TORQUE

1. *Malfunctioning relief valve on tong hydraulic circuit.*
   a. *POSSIBLE PROBLEM: Relief pressure set too low.*

      SOLUTION: Increase setting. To check, block the oil line beyond the relief valve and determine pressure with a gauge.

   b. *POSSIBLE PROBLEM: Relief valve is stuck.*

      SOLUTION: Check for contamination of oil that may inhibit the way the valve actuates. Remove valve and clean, ensuring that the valve spring operates smoothly.

   c. *POSSIBLE PROBLEM: Relief valve is leaking.*

      SOLUTION: Check valve seat for scouring. Check oil seals. Check for particles stuck under the valve system.

2. *POSSIBLE PROBLEM: Directional valve is leaking.*

   SOLUTION: Check directional valve. Neutral position should return fluid directly to the reservoir. Replace or repair valve to ensure correct operation.

3. *POSSIBLE PROBLEM: Power unit is not producing adequate pressure.*

   SOLUTION: Troubleshoot power unit (see user's manual for your particular unit).

4. *POSSIBLE PROBLEM: Poor hydraulic pressure at the tong despite adequate pressure at the power unit, or excessive back pressure in the return line.*

   SOLUTION: Restrictions exist in line between power unit and tong. Inspect integrity of self-sealing couplings to ensure they are allowing full fluid flow. Check to ensure no other restrictions exist (contaminated catch screens or filters, for example).

5. *POSSIBLE PROBLEM: Fluid viscosity is not appropriate (too high or too low).*

   SOLUTION: Ensure hydraulic fluid being used is the viscosity recommended by McCoy Drilling & Completions. Power unit pump may not prime if fluid is too heavy, and the hydraulic system will overheat if fluid is too light. Replace with proper viscosity fluid.

   SOLUTION: Hydraulic fluid viscosity is affected by environmental conditions. Ensure the fluid being used is suitable for high or low temperatures. Replace with proper viscosity fluid for the operating conditions if necessary.

6. *POSSIBLE PROBLEM: Worn or damaged tong motor causing slippage.*

   SOLUTION: Replace or repair worn or damaged motor.

7. *POSSIBLE PROBLEM: Damaged bearings or gears causing excessive drag.*

   SOLUTION: Replace or repair worn or damaged gears or bearings.

8. *POSSIBLE PROBLEM: Jaws slipping on pipe.*

   SOLUTION: Ensure jaw dies are not worn to the point that they cannot grip. Ensure the correct sized jaws are in use.

9. *POSSIBLE PROBLEM: Torque gauge is indicating incorrectly*

   SOLUTION: Incorrect gauge is being used. Ensure gauge is the proper range, and has been properly calibrated for the arm length of the equipment in use.

   SOLUTION: Gauge has been damaged. Check gauge operation and calibration on independant system.

MCCOY DRILLING & COMPLETIONS | FARR
MOVING GLOBAL ENERGY FORWARD

TONG WILL NOT DEVELOP SUFFICIENT TORQUE Cont'd:

10. *POSSIBLE PROBLEM: Load cell is measuring incorrectly.*

    SOLUTION: Incorrect load cell is being used.

    SOLUTION: Air is trapped in torque measuring circuit (load cell, hydraulic line, or gauge. Refer to torque measurement troubleshooting in Section 6 of this manual.

    SOLUTION: Load cell has been damaged. Replace load cell, or return to McCoy for repair and recalibration.

11. *POSSIBLE PROBLEM: Incorrect motor speed selected.*

    SOLUTION: Maximum torque can only be developed when motor is in the lowest speed. Ensure motor is in low speed.

12. *POSSIBLE PROBLEM: Incorrect tong gear selected.*

    SOLUTION: Maximum torque can only be developed when tong is in low gear. Ensure tong is in low gear.

MCCOY COMPLETIONS & DRILLING GUARANTEES CALIBRATION OF A LOAD CELL/ TORQUE GAUGE ASSEMBLY FOR A PERIOD OF ONE YEAR. MCCOY SUGGESTS THAT THE LOAD CELL/TORQUE GAUGE ASSEMBLY BE RETURNED TO THE FACTORY FOR RE-CALIBRATION ON A YEARLY BASIS.

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

B. FAILURE OF JAWS TO GRIP PIPE

1. *POSSIBLE PROBLEM: Dies have become too dull to provide adequate grip.*
   SOLUTION: Replace dies.

2. *POSSIBLE PROBLEM: Incorrect jaws are being used.*
   SOLUTION: Double-check jaw size to ensure they are rated for the diameter of pipe or casing being run.

3. *POSSIBLE PROBLEM: Incorrect dies are being used*
   SOLUTION: Ensure dies loaded in the jaws are appropriate for the type of pipe or casing being run.

4. *POSSIBLE PROBLEM: Brake band(s) is (are) insufficiently adjusted, not allowing jaws to cam properly.*
   SOLUTION: Adjust brake bands to give proper resistance to cage plates.

5. *POSSIBLE PROBLEM: Jaw roller broken or worn.*
   SOLUTION: Remove jaw assembly and inspect. Replace rollers that are visibly "flat-spotted" or otherwise damaged.

MCCOY DRILLING & COMPLETIONS
MOVING GLOBAL ENERGY FORWARD
FARR

C. TONG RUNNING TOO SLOWLY

1. *POSSIBLE PROBLEM: Obstruction in tong hydraulic circuit preventing adequate flow.*
   SOLUTION: Inspect self-sealing couplings to ensure they are properly engaged.
   SOLUTION: The main hydraulic lines (supply and discharge) to the tong are obstructed. Remove and clean if required.

2. *POSSIBLE PROBLEM: Power unit is not producing adequate flow or pressure.*
   SOLUTION: Troubleshoot power unit (see user's manual for your particular unit).

3. *POSSIBLE PROBLEM: Tong motor is excessively worn and is leaking hydraulic fluid past the vanes.*
   SOLUTION: Replace motor, or rebuild as per Section 7 of this manual.

4. *POSSIBLE PROBLEM: Bearings in geartrain and rotary section are excessively worn.*
   SOLUTION: Overhaul tong. See Section 3 of this manual for tong overhaul procedures.

5. *POSSIBLE PROBLEM: Shifter has malfunctioned and the tong is not shifting to high gear.*
   SOLUTION: Inspect and repair shift mechanism as necessary.

6. *POSSIBLE PROBLEM: Two-speed hydraulic motor (if equipped) is not set to correct speed.*
   SOLUTION: Check motor, and set to the correct speed if required.

7. *POSSIBLE PROBLEM: Safety door system is not properly adjusted - hydraulic fluid leak past Deltrol valve.*
   SOLUTION: Check and adjust safety door system.

8. *POSSIBLE PROBLEM: Hydraulic fluid viscosity too high.*
   SOLUTION: Ensure hydraulic fluid meets McCoy Drilling & Completions specifications.
   SOLUTION: Ensure hydraulic fluid is appropriate for climatic conditions, especially during cold-weather operation..

9. *POSSIBLE PROBLEM: By-pass valve not functioning.*
   SOLUTION: Check and repair.

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

D. FAILURE OR DIFFICULTY OF TONG TO SHIFT

1. *POSSIBLE PROBLEM: Bent or broken shifter handle.*
   SOLUTION: Replace shifter handle.

2. *POSSIBLE PROBLEM: Bent or broken shifter yoke.*
   SOLUTION: Inspect and replace shifter yoke.

3. *POSSIBLE PROBLEM: "Frozen" or hard-to-move shifter handle.*
   SOLUTION: Grease shifter shaft.

4. *POSSIBLE PROBLEM: Bent or broken shifter shaft.*
   SOLUTION: Replace.

5. *POSSIBLE PROBLEM: Locking nuts on shifting shaft have loosened and position of yoke has changed.*
   SOLUTION: Reposition yoke and re-tighten locking nuts.

6. *POSSIBLE PROBLEM: Shifting yoke has come loose from shifting shaft*
   SOLUTION: Inspect yoke and inspect for damage. If free of damage, replace on shaft and tighten locking nuts.

7. *POSSIBLE PROBLEM: Tong pops out of gear*
   SOLUTION: Ensure that detent ball & spring assembly has been correctly set.

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

H. GENERAL COMMENTS

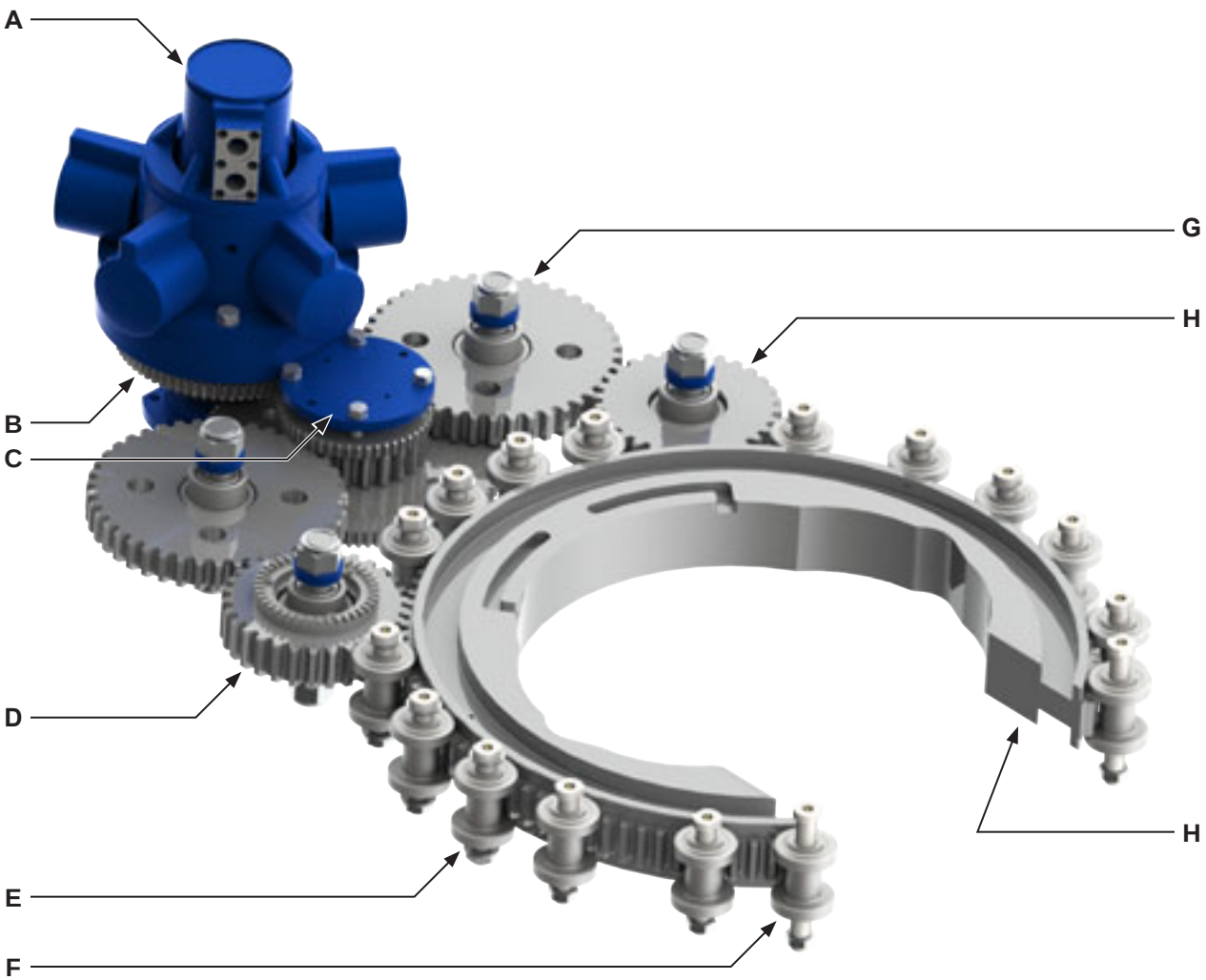
The following factors generally contribute to poor hydraulic operation and premature wear of equipment:

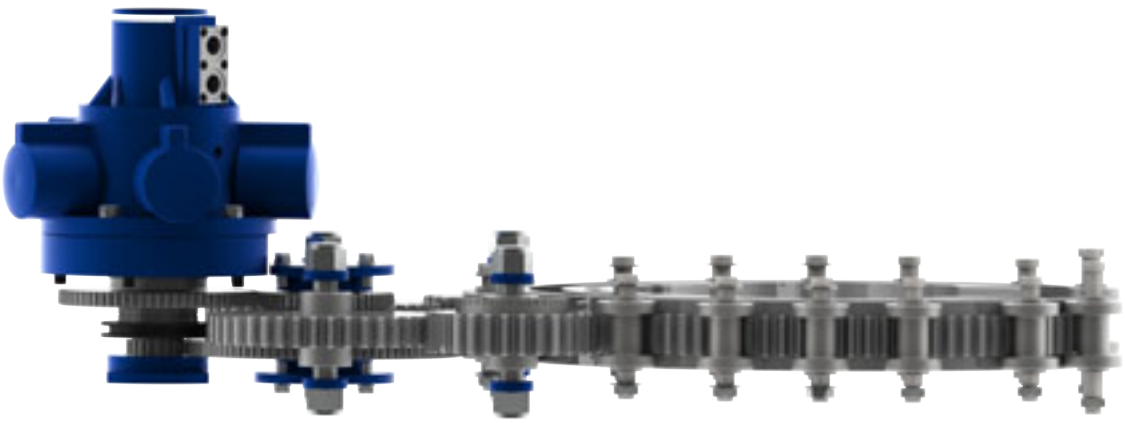
1. *Contaminated hydraulic fluid due to overuse, overheating, or inadequate fluid filtration.*
2. *Unsuitable hydraulic fluid, especially in extreme climatic conditions.*
3. *Defective packing or seals in components of the hydraulic system.*
4. *Poor or incomplete hydraulic system training. Users must be fully qualified to operate the equipment, and have complete understanding of the hydraulic system.*

If your hydraulic troubleshooting procedures involve flow and pressure tests at the power unit, McCoy Completions & Drilling recommends construction of a test rig that can easily be connected to the main suction and discharge ports of the power unit.

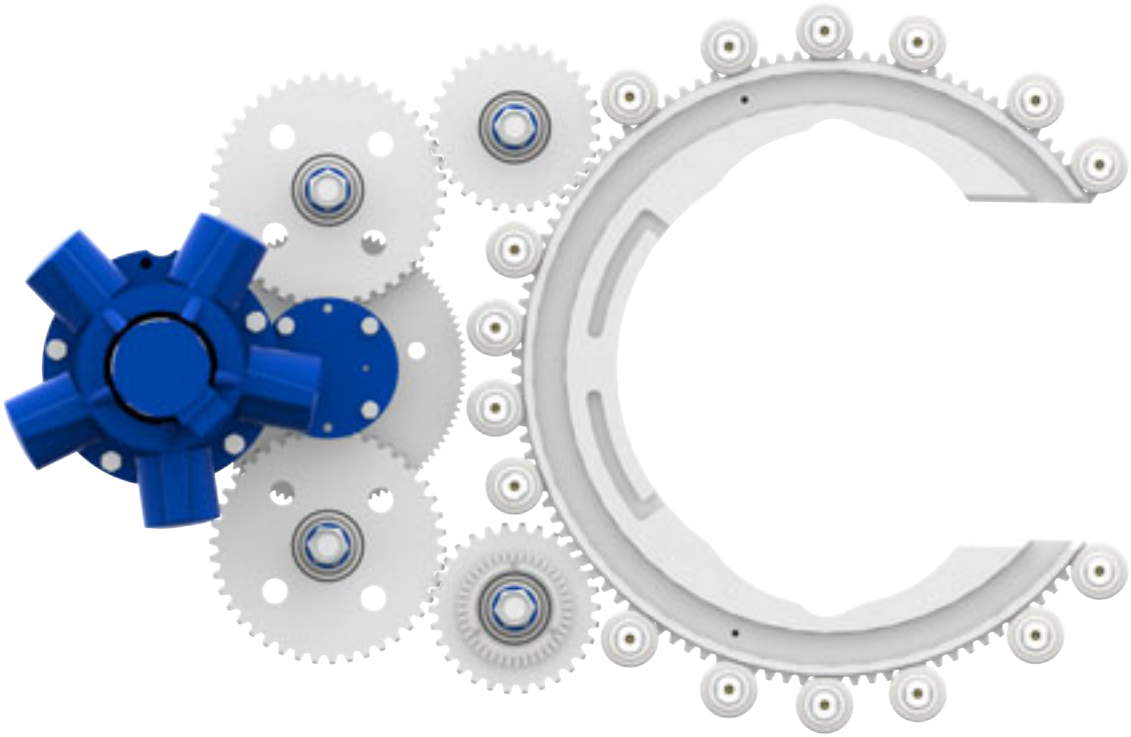
DRILLING & COMPLETIONS | FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Parts & Assemblies



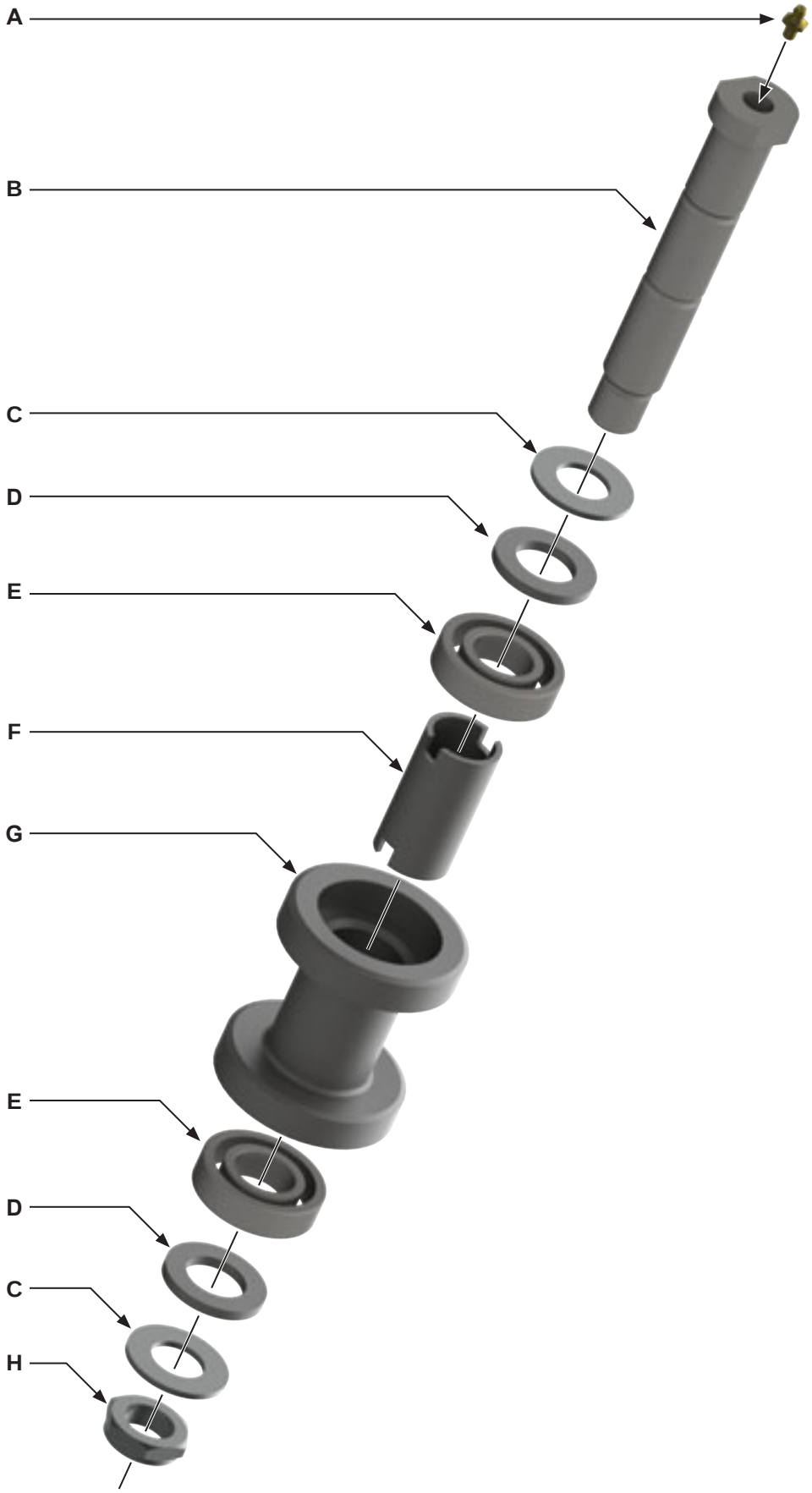


DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD



Item	Type	Description	Qty	Part Number
A	Part	Staffa HMB080/S/S03/70 Hydraulic Motor	1	87-0210B
B	Assembly	Clutch Assembly (Pp. 5.14 - 5.15)	1	
C	Assembly	Pinion Gear Assembly (Pp 5.12 - 5.13)	1	
D	Assembly	Rotary Idler Assembly (With Turn Counter Encoder) (Pp. 5.8 - 5.9)	1	
E	Assembly	Support Roller Assembly (Pp. 5.4 - 5.5)	14	
F	Assembly	Door Pivot Roller Assembly (Pp. 5.4 - 5.5)	2	
G	Assembly	Pinion Idler Assembly (Pp. 5.10-5.11)	2	
H	Assembly	Rotary Idler Assembly (Pp 5.8 - 5.9)	1	
J	Part	Rotary Gear	1	1037-D-46

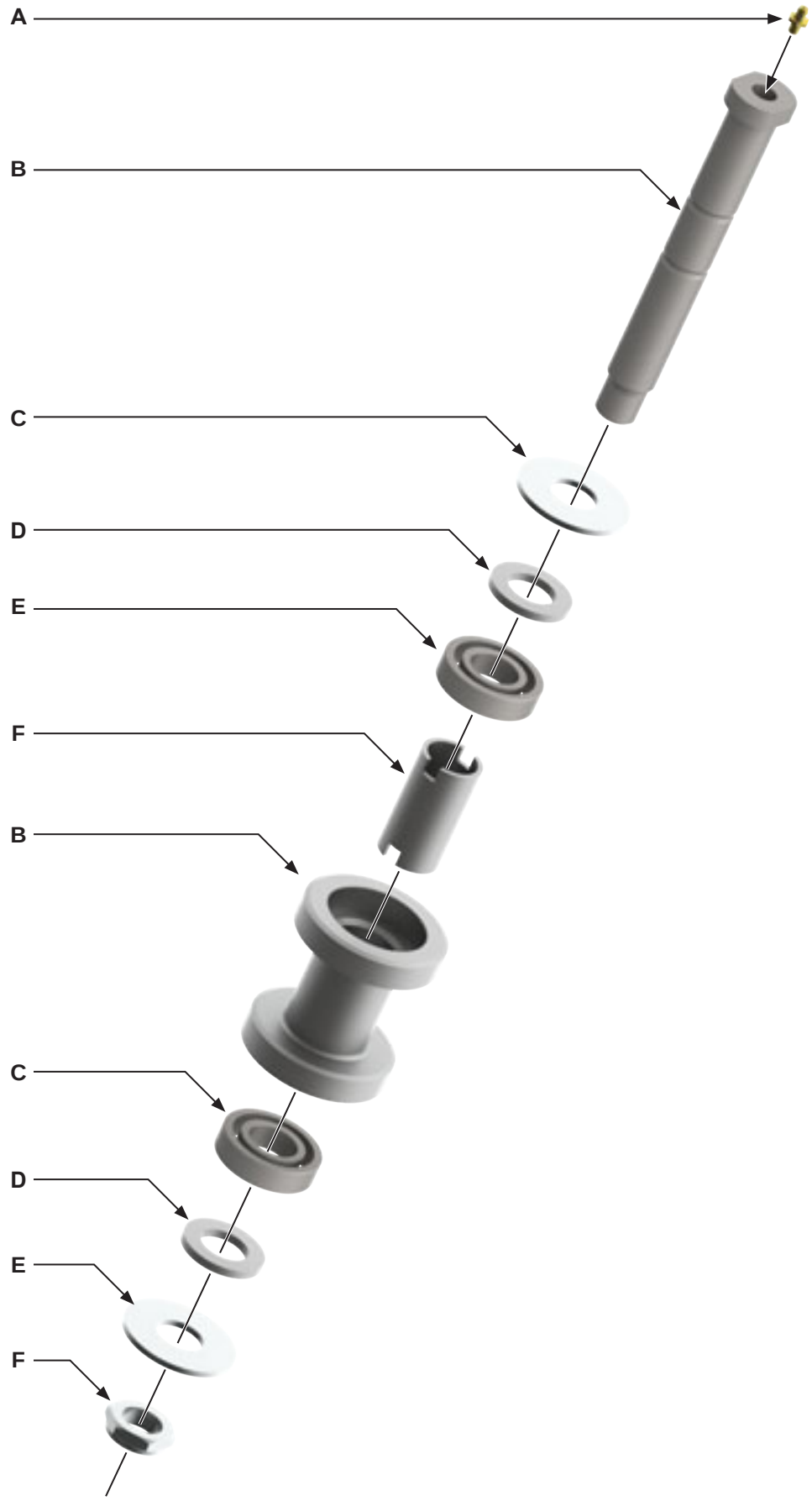
DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD



DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Item	Type	Description	Qty	Part Number
A	Part	1/4" NF Grease Fitting	2	02-0097
B	Part	Support Roller Shaft	1	101-3939
C	Part	1" Narrow Washer	2	09-5026
D	Part	Roller Bearing Spacer	2	101-3871
E	Part	Support Roller Bearing	2	02-0094
F	Part	Support Roller Spacer	1	1037-C-134
G	Part	Support Roller	1	1037-135
H	Part	1" UNS Thin Nylock Nut	1	09-5627

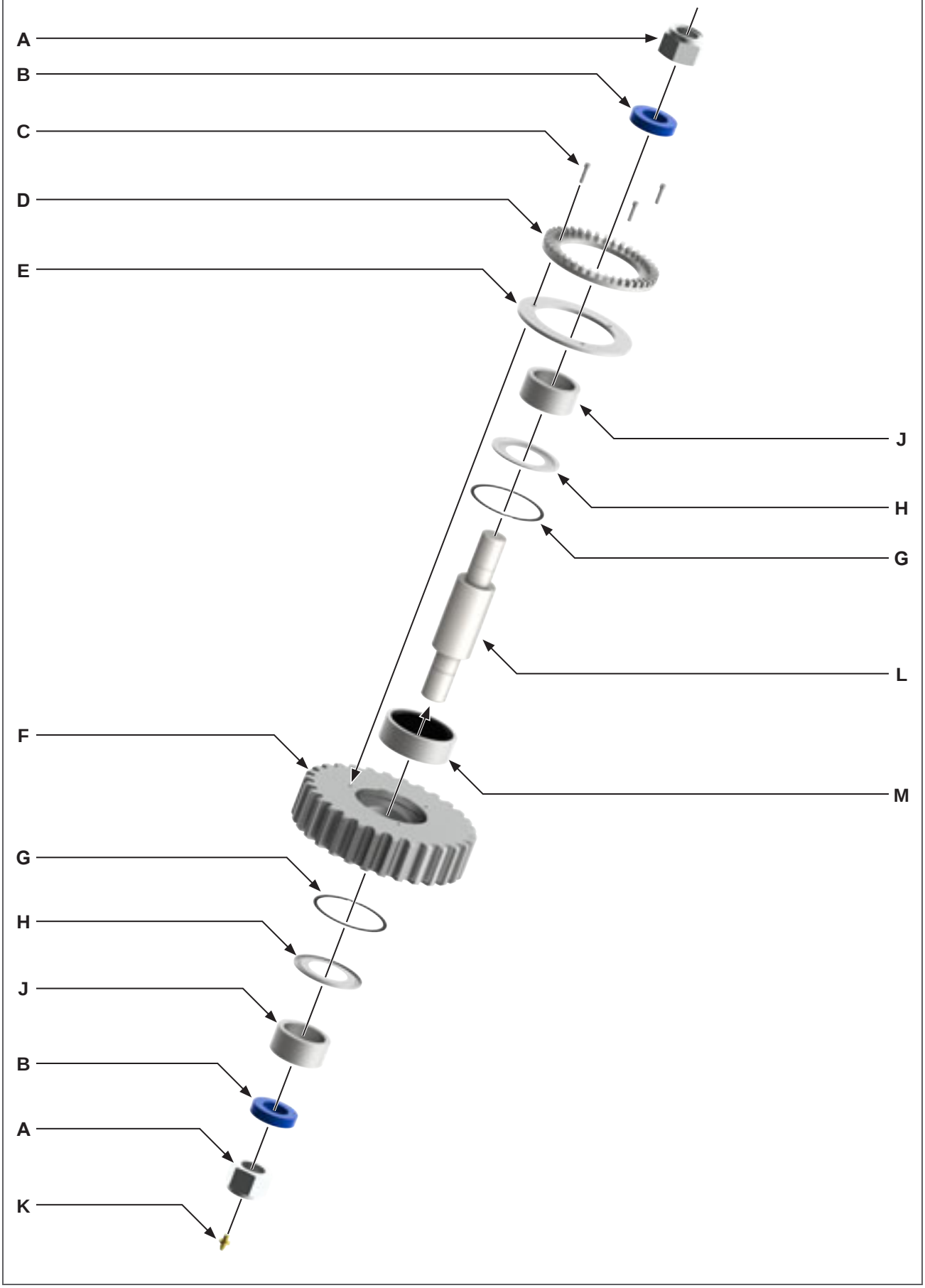
DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD



DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Item	Type	Description	Qty	Part Number
A	Part	1/4" NF Grease Fitting	1	02-0097
B	Part	Support Roller Shaft	1	101-3940
C	Part	1-1/8" Flatwasher	2	09-5041
D	Part	Roller Bearing Spacer	2	101-3871
E	Part	Support Roller Bearing	2	02-0094
F	Part	Support Roller Spacer	1	1037-C-134
G	Part	Support Roller	1	1037-135
H	Part	1" UNS Thin Nylock Nut	1	09-5627

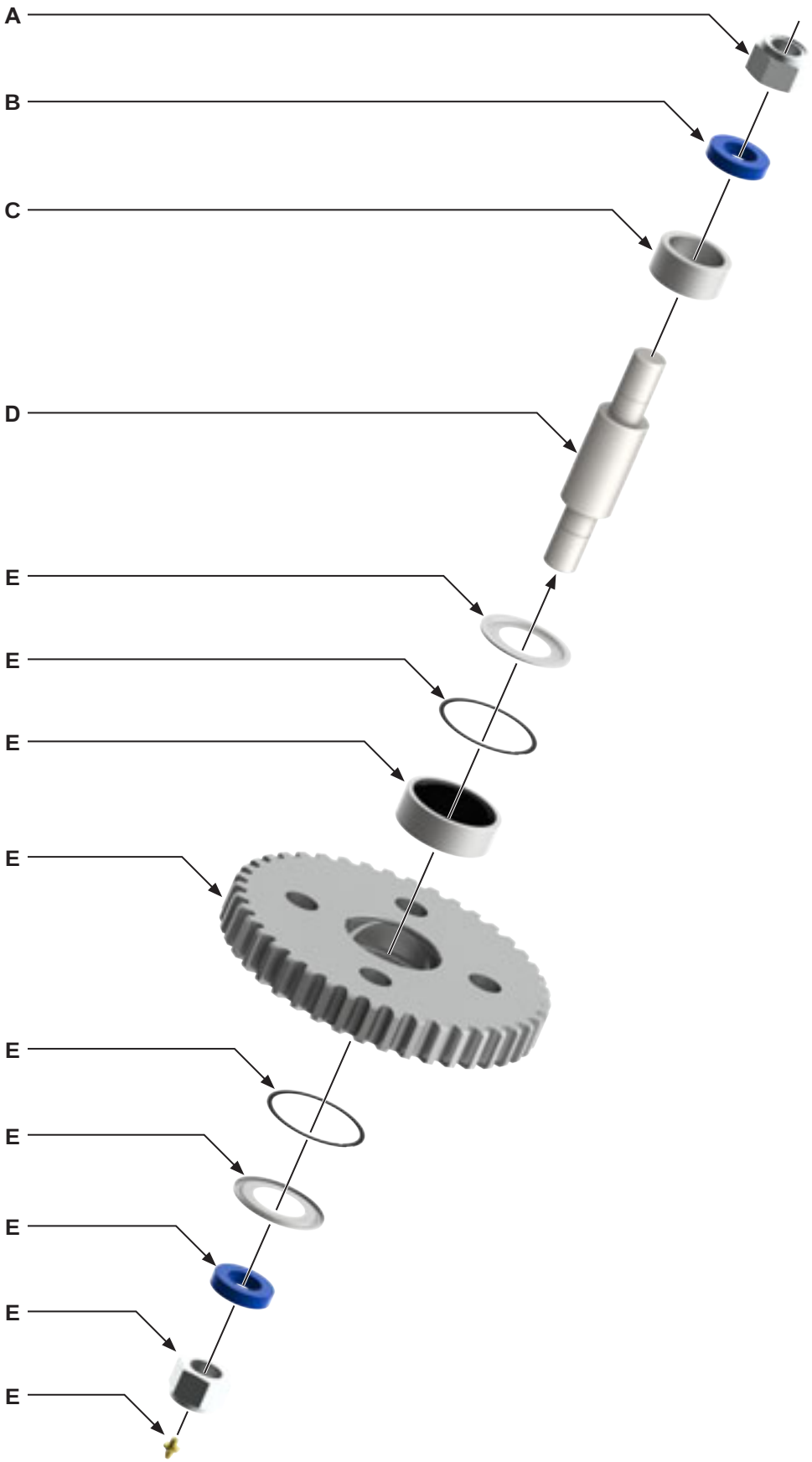
DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD



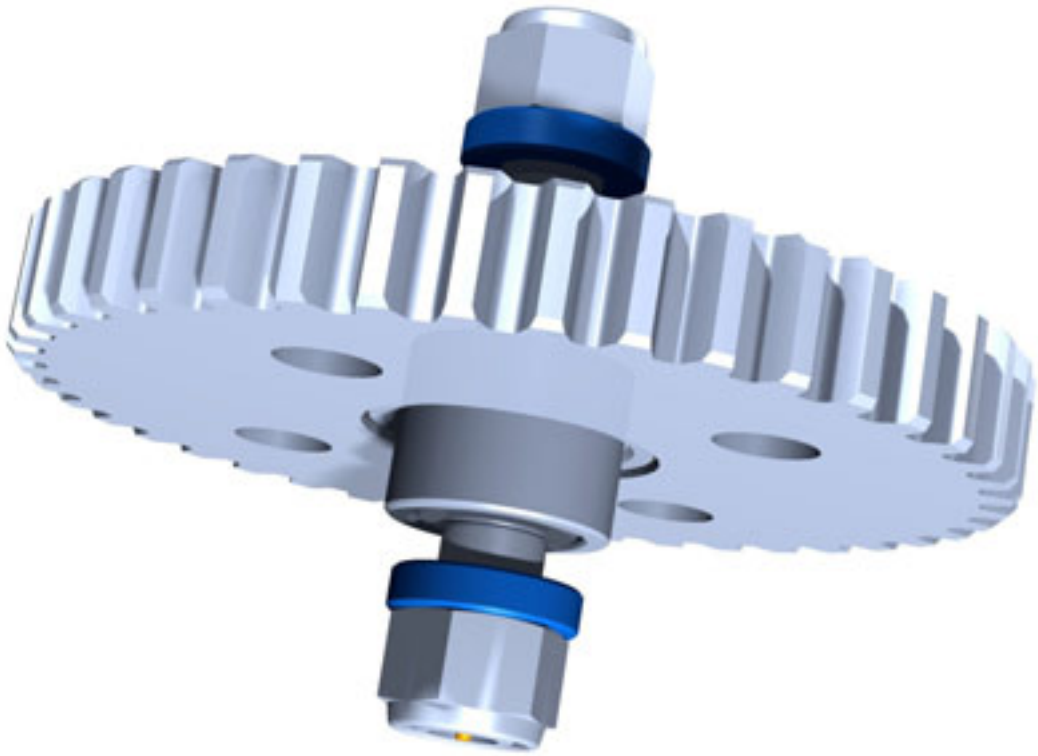
DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Item	Type	Description	Qty	Part Number
A	Part	1-1/2" UNF LockNut	2	09-5740
B	Part	Rotary Idler Pad	2	1037-A-8
C	Part	1/4" NC x 1" Hex Socket Head Cap Screw	3	09-2007
D	Part	Turn Counter Encoder	1	1482-59-01
E	Part	Turn Counter Encoder Spacer	1	101-1712
F	Part	Rotary Idler Gear	1	1037-D59
G	Part	Retainer Clip	2	02-0009
H	Part	Bearing Seal	2	02-0010
J	Part	Idler Spacer	2	1050-D5-121
K	Part	Grease Fitting	1	02-0005
L	Part	Rotary Idler Shaft	1	1050-D5-117
M	Part	Cylindrical Roller Bearing	1	02-0011

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

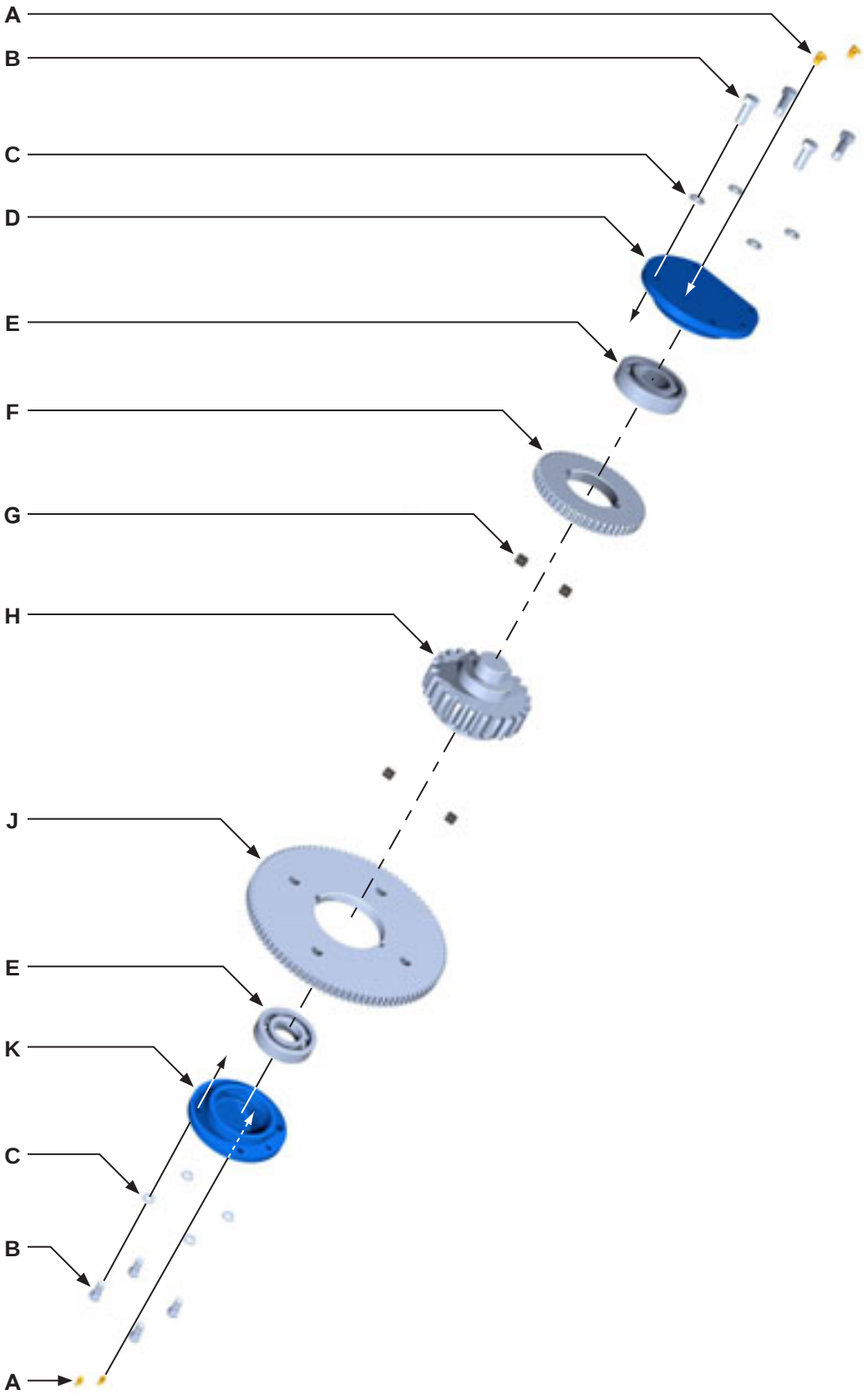


DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

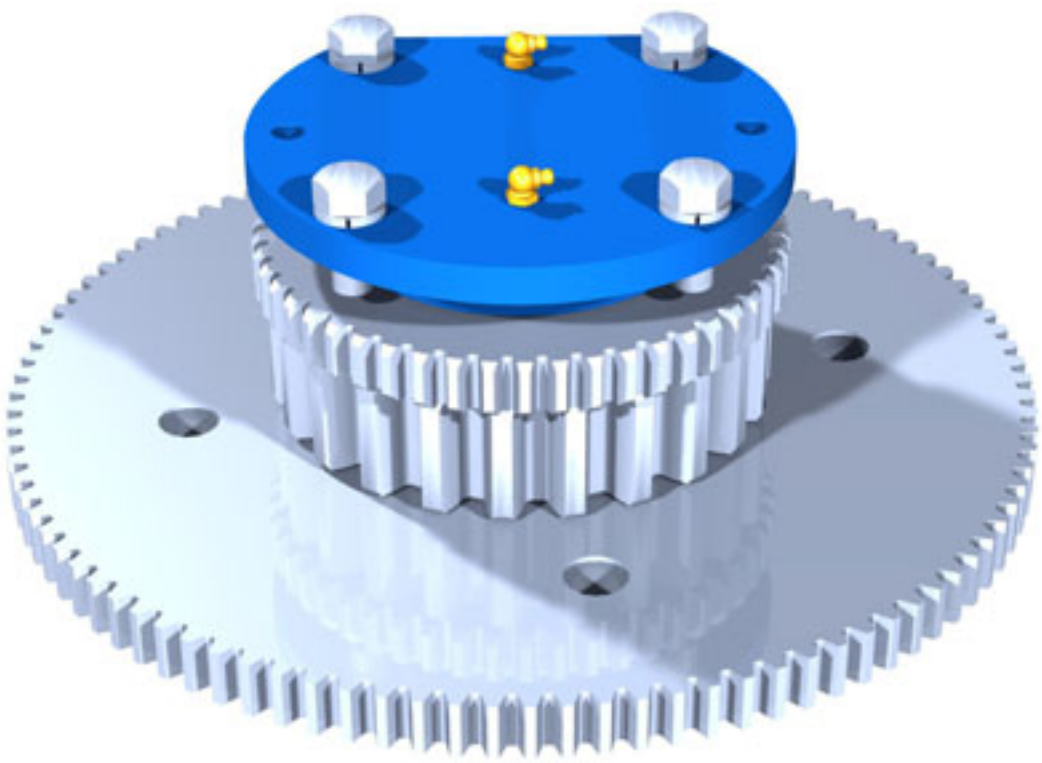


Item	Type	Description	Qty	Part Number
A	Part	1-1/2" UNF Nylock Nut	2	09-5740
B	Part	Pinion Idler Pad	2	1037-A-8
C	Part	Idler Spacer	2	1050-D5-121
D	Part	Pinion Idler Shaft	1	1050-D5-117
E	Part	Retainer Clip	2	02-0009
F	Part	Bearing Seal	2	02-0010
G	Part	Cylindrical Roller Bearing	1	02-0011
H	Part	Grease Fitting	1	02-0005
J	Part	Pinion Idler Gear	1	1037-D-1

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

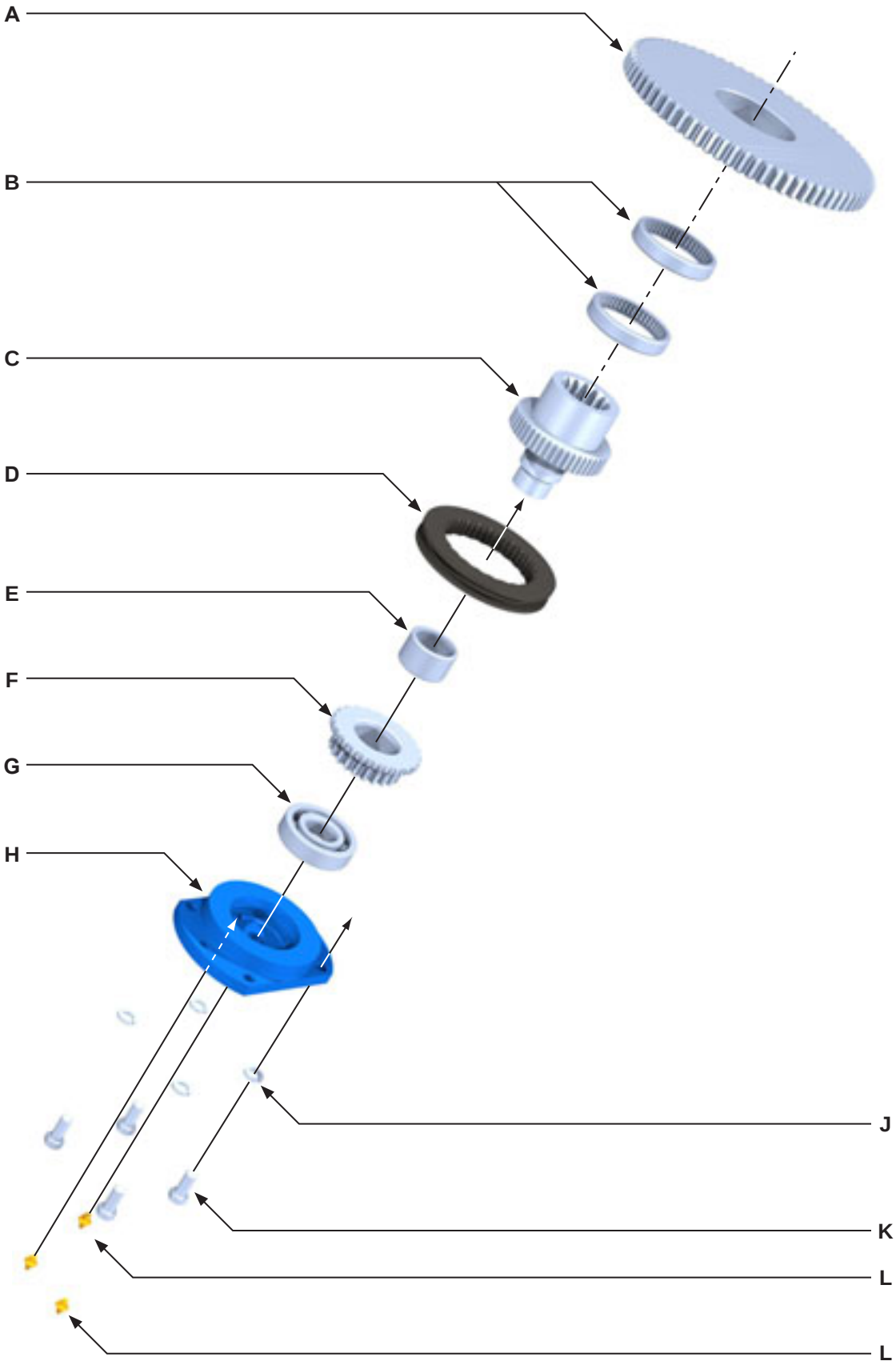


DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

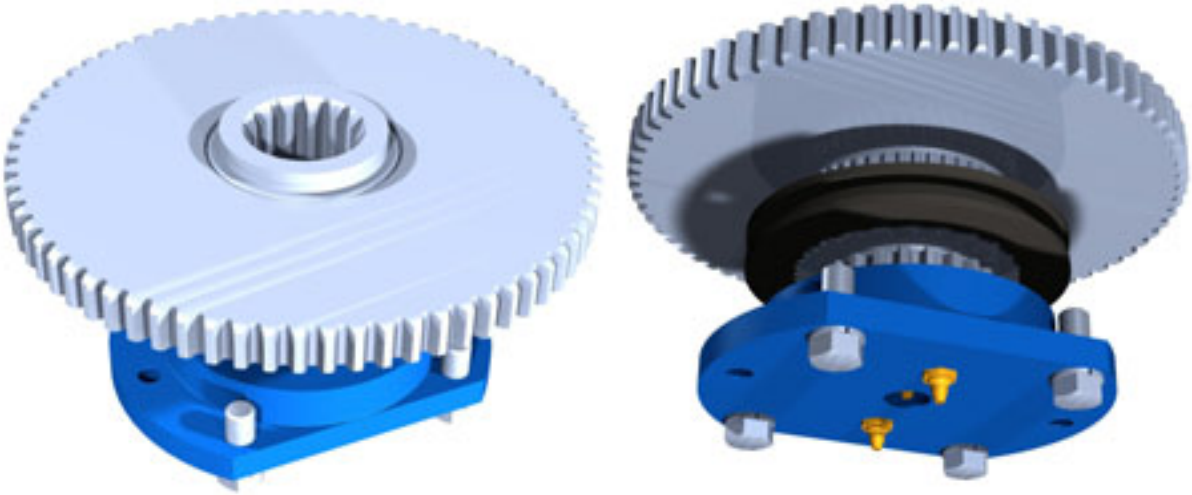


Item	Type	Description	Qty	Part Number
A	Part	1/8" NPT x 90^{o} Grease Fitting	4	02-0093
B	Part	5/8" NC x 1-1/4" Hex Bolts	8	09-1228
C	Part	5/8" Lock Washers	8	09-5114
D	Part	Top Pinion Bearing Cap	1	1037-C-10
E	Part	Pinion Bearing	2	02-0106
F	Part	High Pinion Gear	1	1037-D-12
G	Part	Gear Key	4	1037-D-15A
H	Part	Pinion Gear	1	1037-D-15
J	Part	Low Pinion Gear	1	1037-D-32
K	Part	Bottom Pinion Bearing Cap	1	1037-C-33

MCCOY | DRILLING & COMPLETIONS
MOVING GLOBAL ENERGY FORWARD
FARR

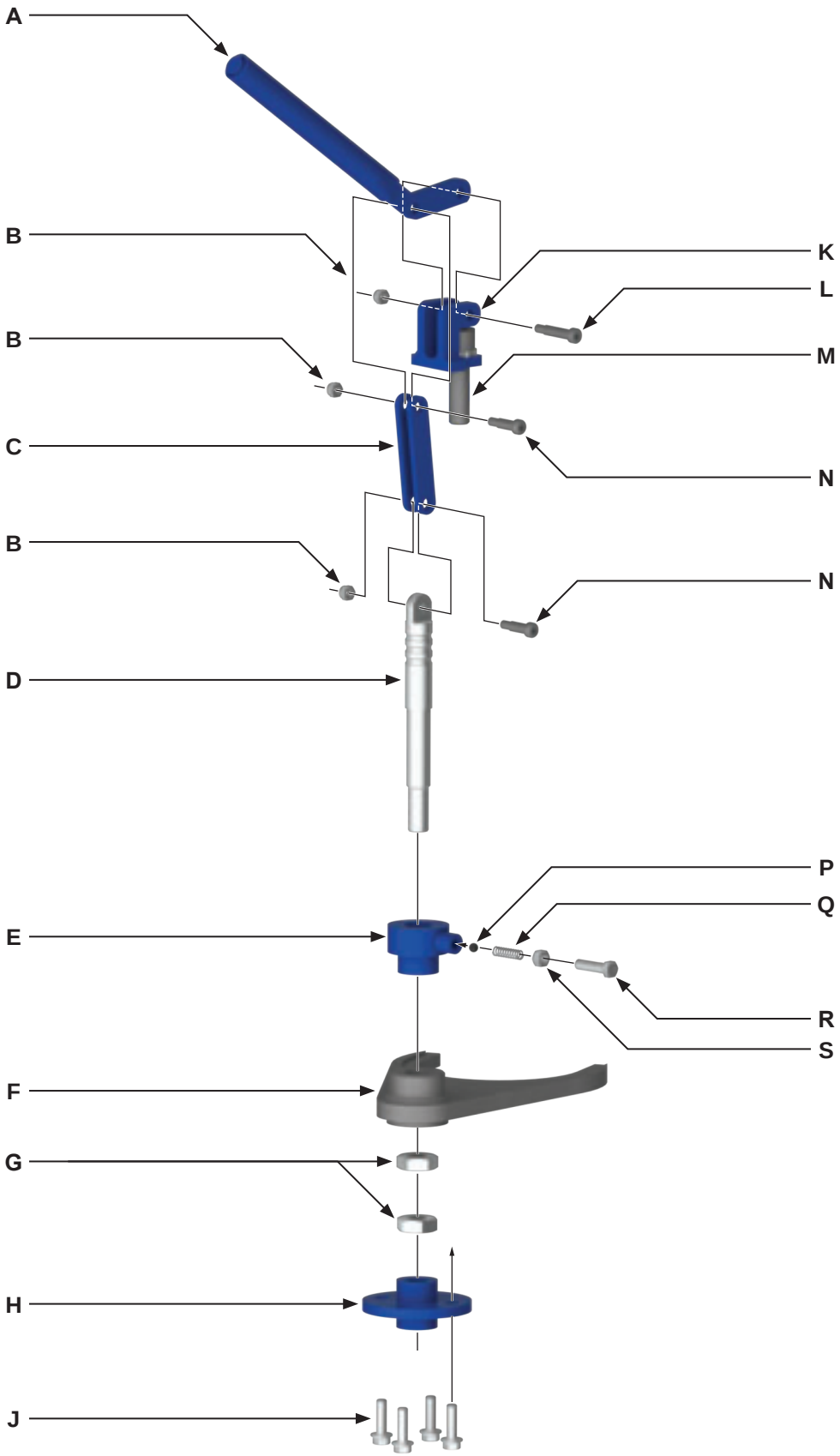


DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD



Item	Type	Description	Qty	Part Number
A	Part	High Clutch Gear	1	1037-D-41
B	Part	Top Clutch Bearing	2	02-0103
C	Part	Splined Clutch Shaft	1	1037-D-38
D	Part	Shifting Collar	1	1037-D-34
E	Part	1/8" NPT Grease Fitting	3	02-0005
F	Part	5/8" NC x 1-1/2" Hex Bolts	4	09-1230
G	Part	5/8" Lock Washers	4	09-5114
H	Part	Clutch Bearing Cap	1	1037-C-17
J	Part	Bottom Clutch Bearing	1	02-0105
K	Part	Low Clutch Gear	1	1037-D-40
L	Part	Clutch Bearing	1	02-0104

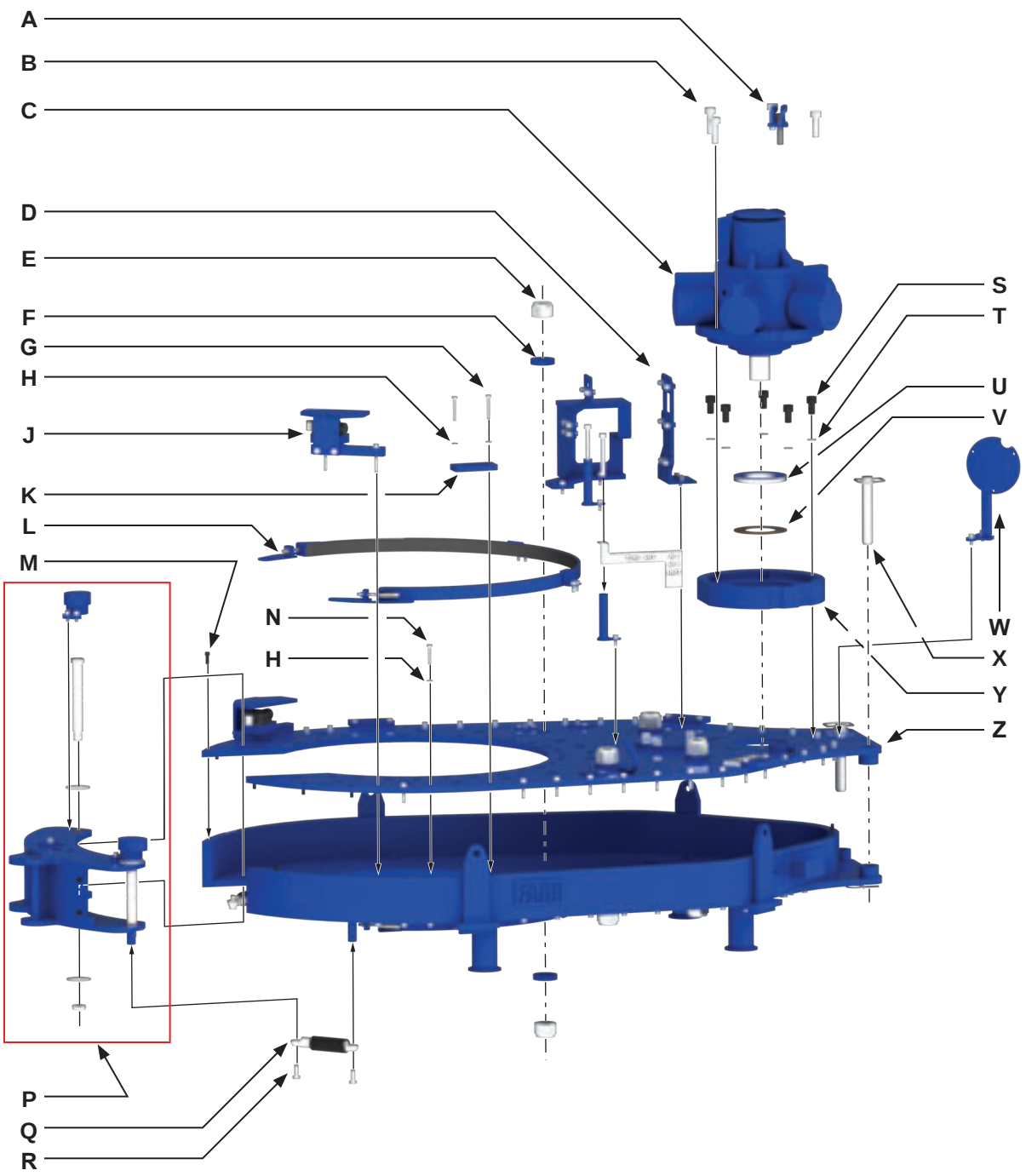
DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD



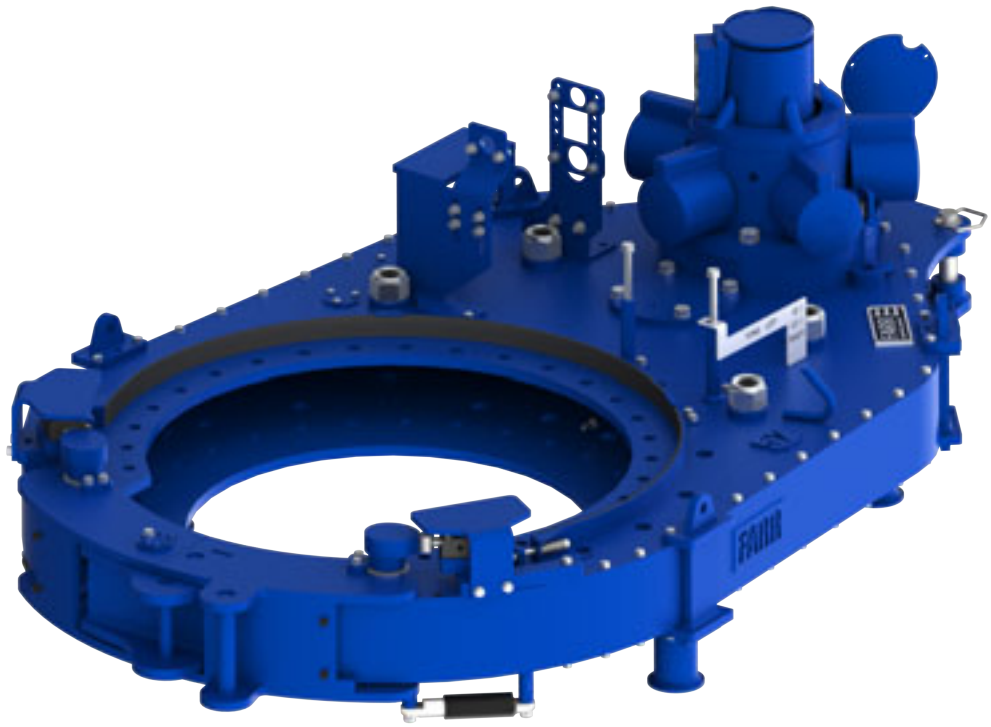
DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Item	Type	Description	Qty	Part Number
A	Weldment	Shifting Lever Weldment	1	1037-D-20B
B	Part	7/16” UNC Thin Hex Nylock Nut	3	
C	Part	Shifting Link	2	101-5116
D	Part	Shifting Shaft	1	1037-C-20A
E	Weldment	Top Shifter Bushing Weldment (Typically Welded To Top Plate)	1	101-1286
F	Weldment	Shifting Fork Weldment	1	1037-D-27
G	Part	7/8” UNF Hex Jam Nut	2	09-1489
H	Part	Bottom Shifter Bushing	1	1037-C-21B
J	Part	3/8” NC x 1” Hex Bolt	4	09-1170
	Part	3/8” Lockwasher	4	09-5106
K	Weldment	Shifter Lug Weldment	1	101-5114
L	Part	3/8” x 1-1/2” NC Shoulder Bolt	1	09-0151
M	Part	3/4” UNC x 2-3/4” Hex Socket Head Cap Screw	1	09-2297
	Part	3/4” Lockwasher	1	09-5118
N	Part	3/8” x 1” NC Shoulder Bolt	2	09-1118
P	Part	Detent Ball	1	02-0018
Q	Part	Detent Spring	1	997-0-64
R	Part	7/16” UNF x 1-1/2” Hex Bolt	1	09-1610
S	Part	7/16” UNF Hex Jam Nut	1	09-5508

MCCOY | DRILLING & COMPLETIONS
MOVING GLOBAL ENERGY FORWARD
FARR

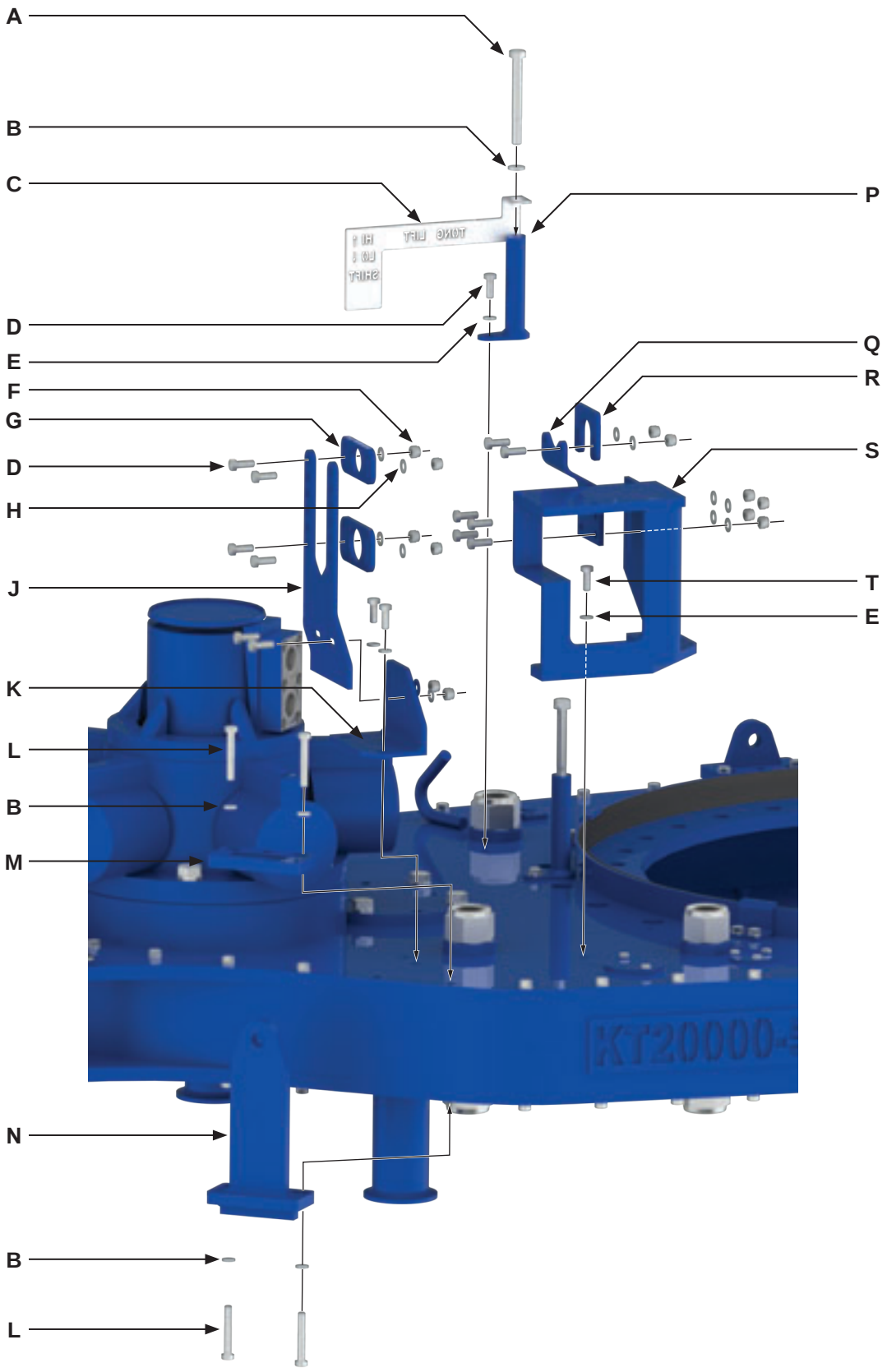


DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD



Item	Type	Description	Qty	Part Number
A	Part	Shifter Pivot Lug Weldment (See Pp. 5.16 - 5.17)	1	
B	Part	3/4" NC x 2-1/2" Hex Bolt	5	09-1296
	Part	3/4" Lockwasher	10	09-5118
C	Part	HMB080/S/S03/70 Staffa Motor	1	87-0210B
D	Assembly	Hydraulic Supports (See Pp. 5.20 - 5.21)		
E	Part	1-1/4" UNF Hex Nylock Net	8	09-5740
F	Part	Idler Pad	8	997-D20-125
G	Part	3/8" NC x 2-1/2" Hex Bolt	16	09-1056
H	Part	3/8" Lockwasher	66	09-5106
J	Assembly	Safety Door Valve Assembly (See Pp. 7.32 - 7.33)	2	
K	Part	Hanger Base Plate	4	101-4006
L	Assembly	Brakeband Assembly (See Pp. 7.22 - 7.23)	2	
M	Part	3/8" NC x 1-1/2" Hex SHCS	12	09-2051
N	Part	3/8" NC x 2" Hex Bolt	50	09-1054
P	Assembly	Door Assembly (See Pp. 28 - 31)	1	
Q	Assembly	Door Cylinder	2	1037-A4-144
R	Part	1/2" UNC x 1-1/2" Hex Bolt	4	09-1170
S	Part	3/4" NC x 1-1/4" Hex SHCS (Motor Mount)	5	09-2288
T	Part	3/4" Lockwasher (Motor & Motor Mount)	10	09-5118
U	Part	Upper Motor Spacer	1	1037-D-38S
V	Part	Lower Motor Spacer	1	101-3289
W	Assembly	Torque Gauge Holder	1	
	Weldment	Torque Gauge Holder Weldment	1	101-0480
	Weldment	Torque Gauge Mount Weldment	1	1500-09-03A
X	Part	Load Cell Tie-Off	2	02-0225
Y	Part	Motor Mount	1	1037-D-7
Z	Part	Top Plate Weldment	1	1037-7BJ

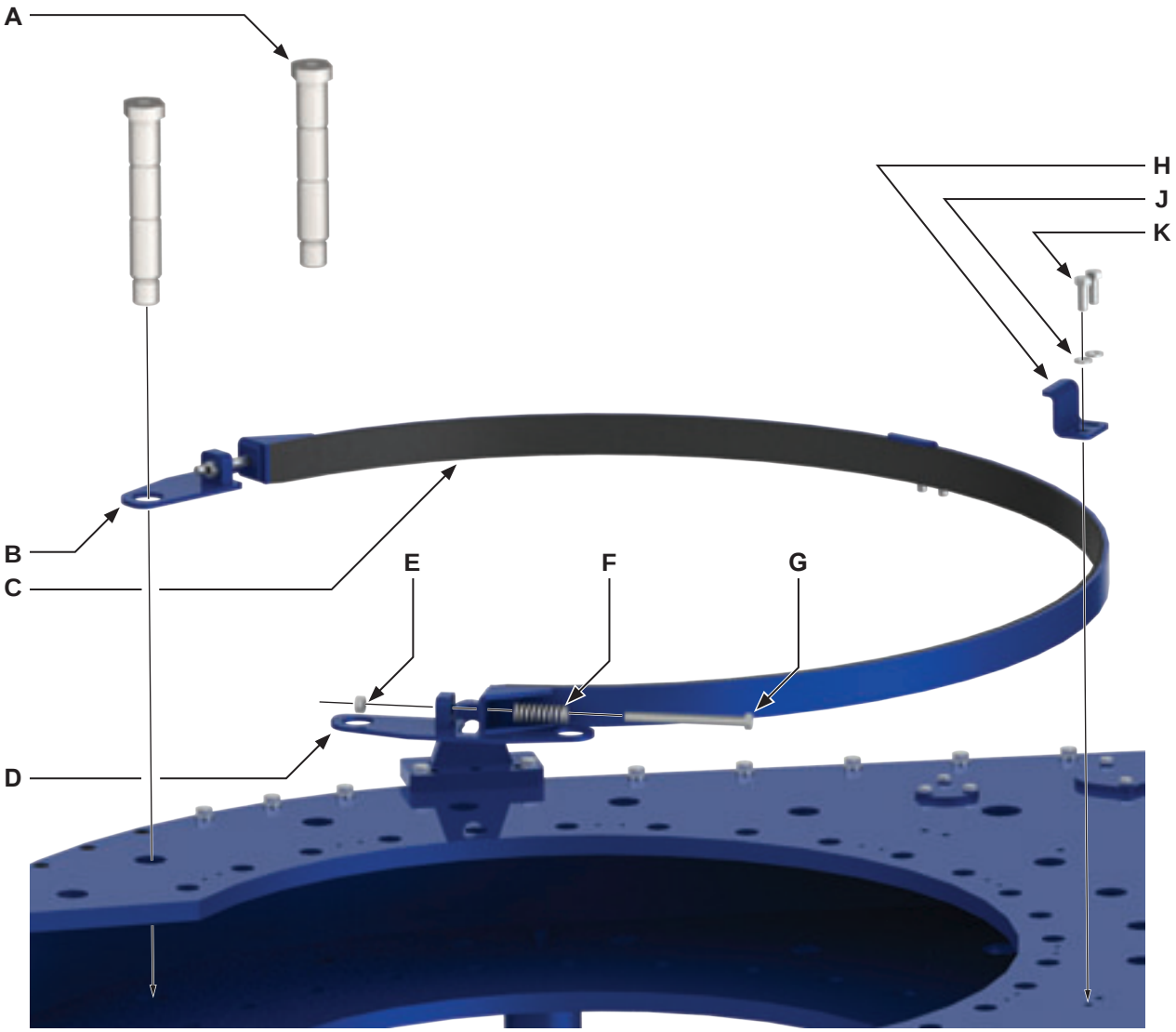
MCCOY DRILLING & COMPLETIONS
MOVING GLOBAL ENERGY FORWARD
FARR



DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Item	Type	Description	Qty	Part Number
A	Part	1/2" UNC X 4-1/2" Hex Bolt	2	09-1184
B	Part	1/2" Lockwasher	18	09-5110
C	Part	Valve Function Control Plate	1	1037-7-8
D	Part	3/8" UNC x 1" Hex Bolt	14	09-1046
E	Part	3/8" Lockwasher	2	09-5106
F	Part	3/8" UNC Nylock Nut	12	09-5607
G	Part	Hydraulic Inlet Support Plate (Upper)	1	101-5121
	Part	Hydraulic Inlet Support Plate (Lower)	1	101-5122
H	Part	3/8" Narrow Flatwasher	12	09-5124
J	Part	Hydraulic Inlet Support Plate	1	101-1946
K	Weldment	Hydraulic Inlet Support Base	1	101-1943
L	Part	3/8" NC x 3" Hex Bolt	16	09-1058
M	Part	Hanger Bracket Plate	4	101-4006
N	Weldment	Hanger Weldment	4	101-3985
P	Weldment	Valve Support Weldment	2	101-1442
Q	Part	Hydraulic Outlet Support Plate	1	101-1775
R	Part	Hydraulic Outlet Support Adjustment Plate	1	101-5123
S	Part	Dump Valve Support Weldment	1	101-4850
T	Part	3/8" UNC x 1-1/4" Hex Bolt	2	09-1048

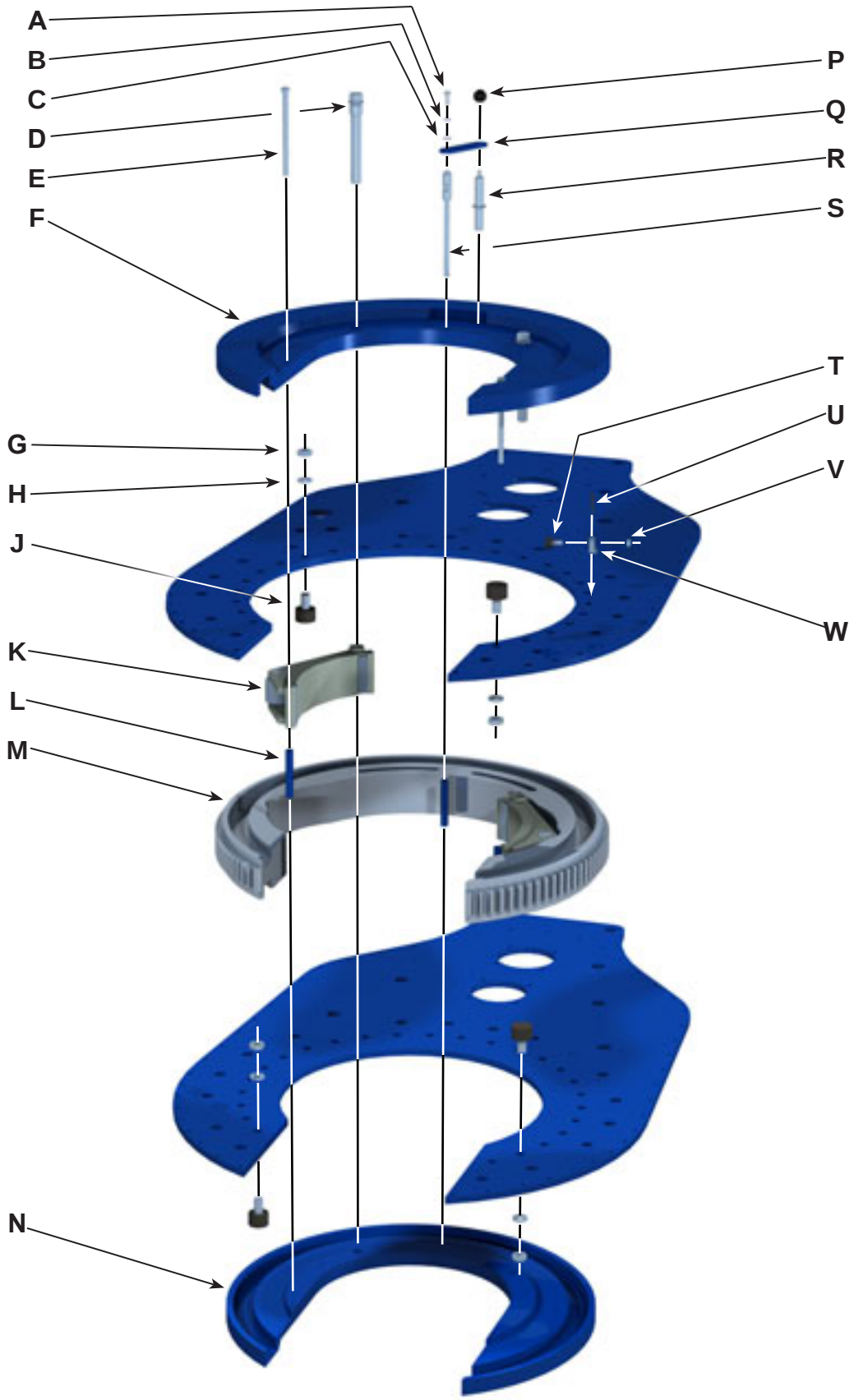
DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD



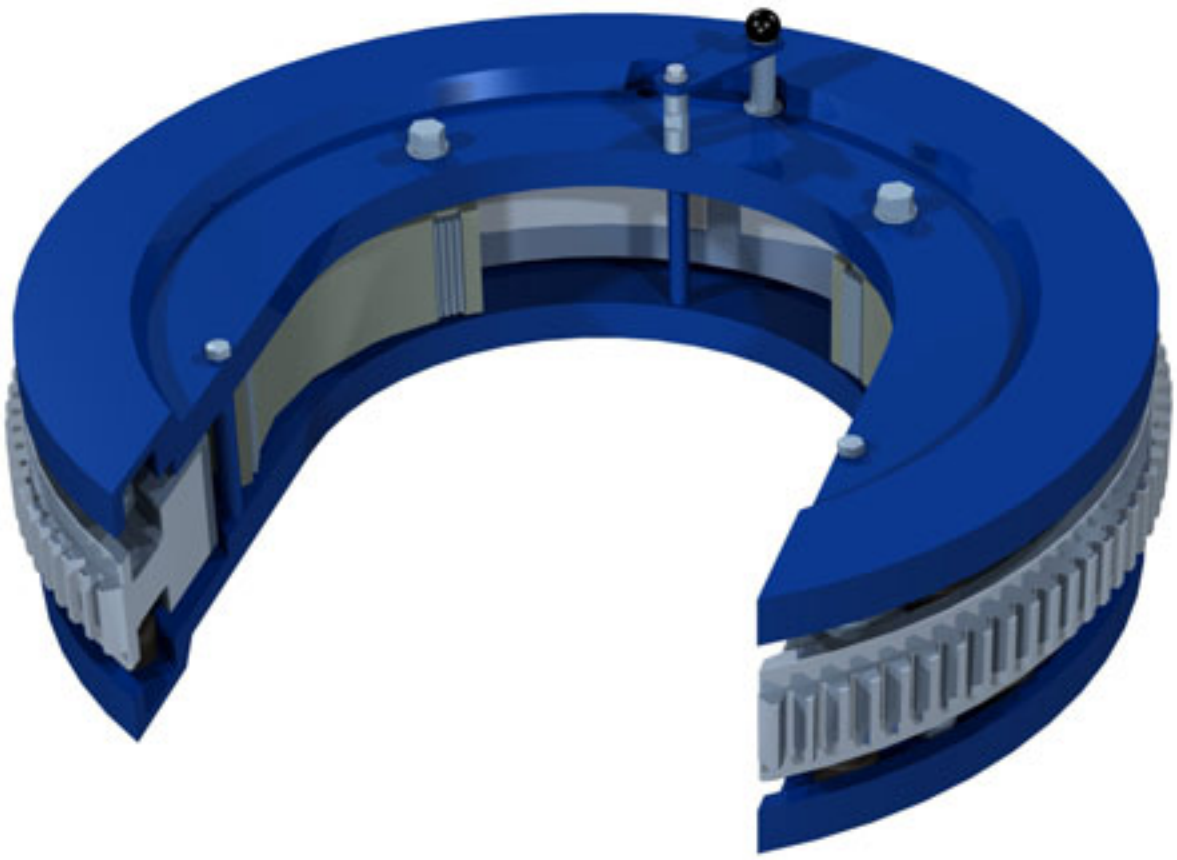
DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Item	Type	Description	Qty	Part Number
A	Part	Support Roller Shaft (Shown For Illustration Purposes Only)	4	101-3939
B	Weldment	Brakeband Lug Weldment (RH Top, LH Bottom)	2	101-1636
C	Weldment	Brakeband Weldment (Lined)	2	1037-D-63
D	Weldment	Brakeband Lug Weldment (LH Top, RH Bottom)	2	101-1637
E	Part	3/8” NC Hex Nylock Nut	4	09-5607
F	Part	Brakeband Spring	4	9588K340
G	Part	3/8” NC x 4-1/2” Hex Bolt	4	09-1064
H	Part	Brakeband Retainer	4	101-1631
J	Part	3/8” Regular Carbon Steel Lockwasher	8	09-5106
K	Part	3/8” NC x 1” Hex Bolt	8	09-1170

MCCOY | DRILLING & COMPLETIONS
MOVING GLOBAL ENERGY FORWARD
FARR

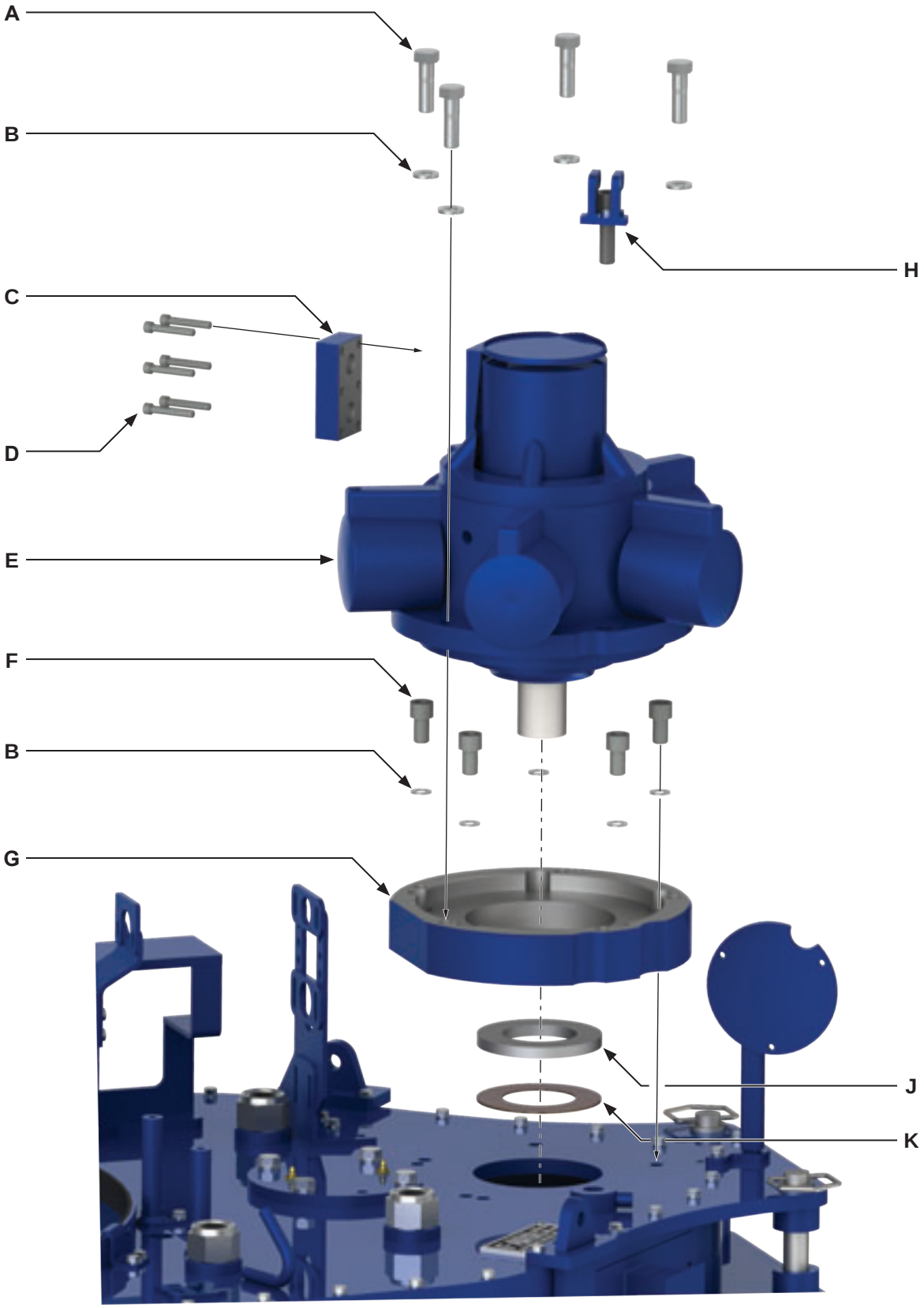


DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

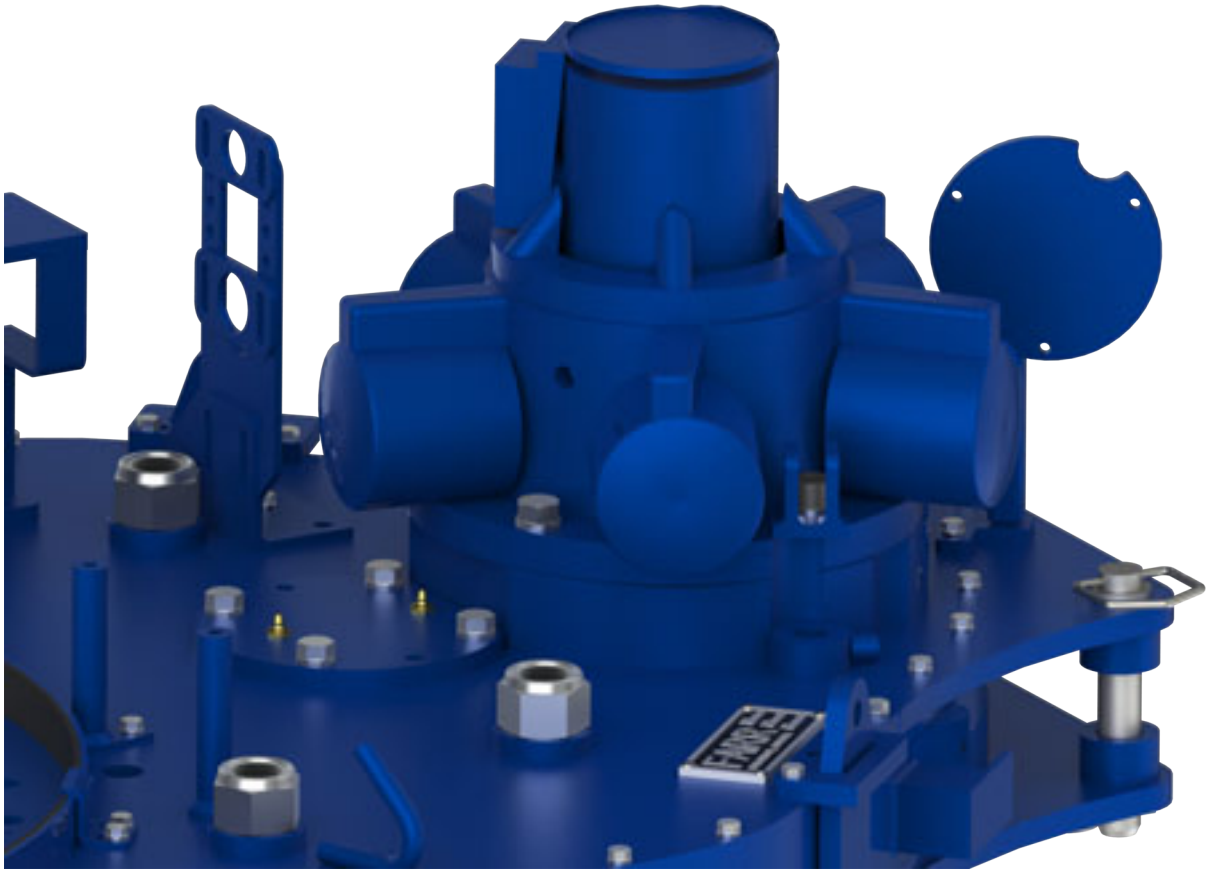


Item	Type	Description	Qty	Part Number
A	Part	3/8" NC x 1" Hex Bolt	1	09-1170
B	Part	3/8" Regular Carbon Steel Lockwasher	1	09-5106
C	Part	3/8" Narrow Washer	1	09-5124
D	Part	Jaw Pivot Bolt	2	1050-C5-28
E	Part	1/2" NC x 8" Hex Bolt	2	09-1198
F	Part	Top Cageplate	1	101-1580
G	Part	7/8" UNF Thin Hex Jam Nut	50	09-1489
H	Part	7/8" Regular Carbon Steel Lockwasher	50	09-5122
J	Part	Cam Follower	50	02-0107
K	Assembly	Jaw Die Kit (20" shown - See Pg. 2.11)	2	
L	Part	Cageplate Spacer	3	1037-C-38
M	Part	Rotary Gear	1	1037-D-46
N	Part	Bottom Cageplate	1	1037-D-51
P	Part	Backing Pin Knob	1	02-0017
Q	Part	Backing Pin Retainer	1	1037-B-54-1
R	Part	Backing Pin	1	1037-C-39A
S	Part	Rear Cageplate Bolt	1	1037-36
T	Part	Cam Follower	10	02-0108
U	Part	10-24 x 1-1/2" Hex SHCS	20	09-0236
V	Part	7/16" UNF Thin Nylock Nut	10	09-5628
W	Part	Horizontal Cam Follower Guide	10	1037-A-49

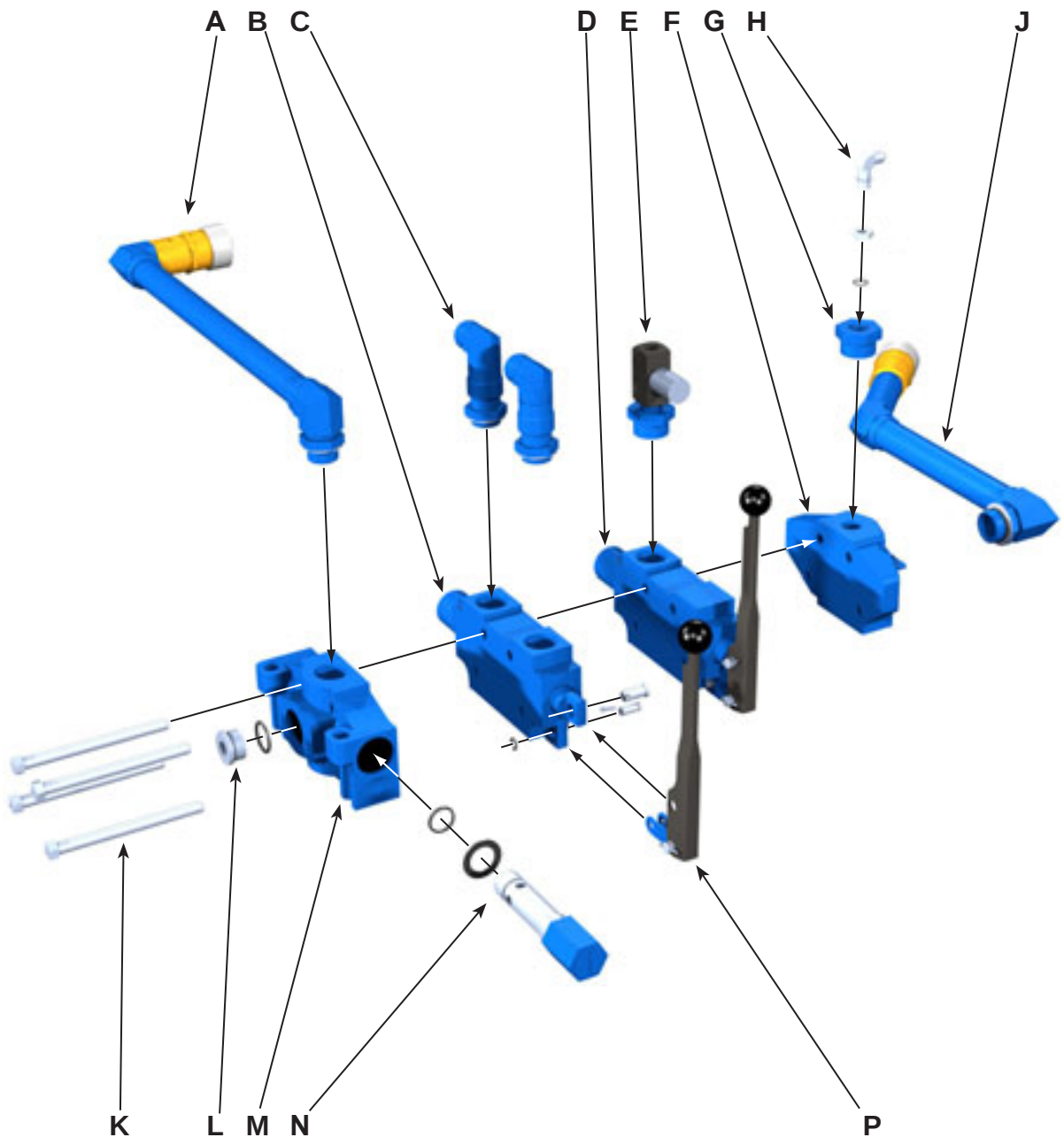
MCCOY DRILLING & COMPLETIONS
MOVING GLOBAL ENERGY FORWARD
FARR



DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

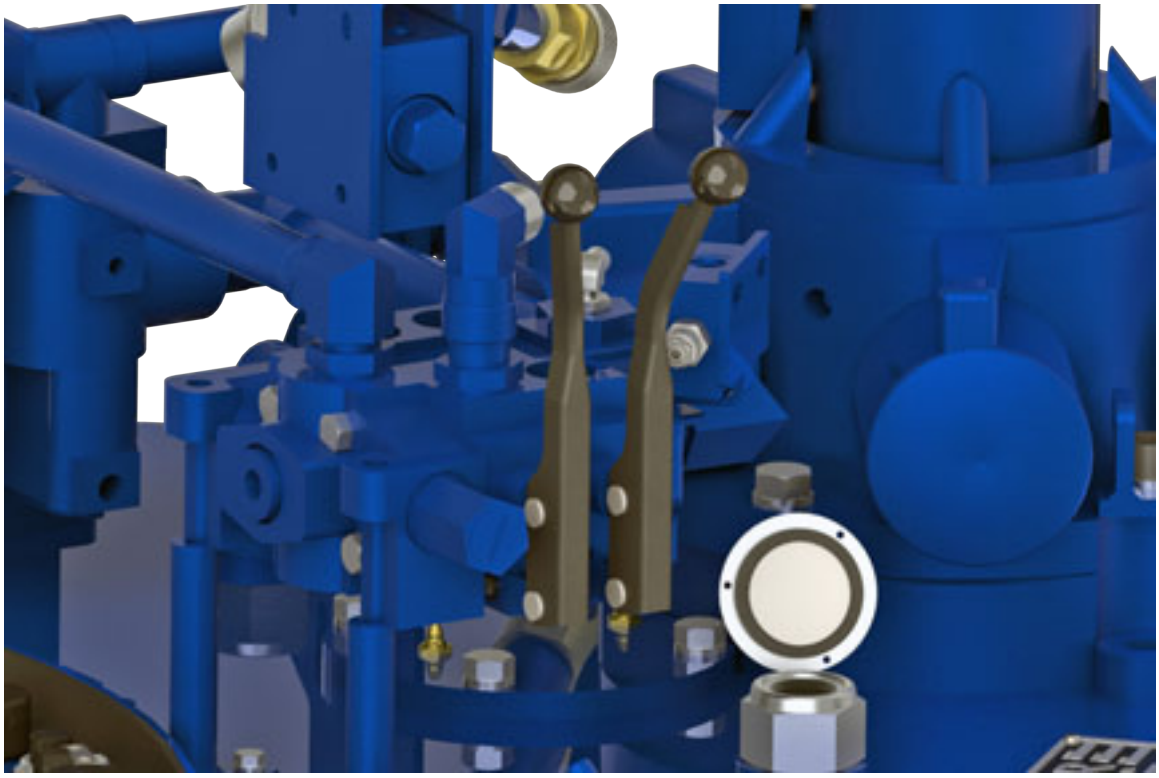


Item	Type	Description	Qty	Part Number
A	Part	3/4" NC x 2-1/2" Hex Bolt	4	09-1296
B	Part	3/4" Regular Carbon Steel Lockwasher	10	09-5118
C	Part	Manifold Block	1	87-0209
D	Part	3/8" UNC x 2-1/4" Hex Socket Head Cap Screw	6	02-0974
E	Part	HMB080/S/S03/70 Staffa Motor	1	87-0210B
F	Part	3/4" NC x 1-1/4" Hex SHCS	5	1050-C5-28
G	Part	Motor Mount	1	1037-D-7
H	Weldment	Shifter Pivot Lug Weldment (See Pp. 5.16 - 5.17)	1	
J	Part	Upper Motor Spacer	1	1037-D-38S
K	Part	Thrust Washer	1	101-3289



Item	Type	Description	Qty	Part Number
A	Assembly	1" Hydraulic Line (Supply)	1	
	Part	1" Dust Cup	1	02-9213
	Part	1" Quick-Coupler Fitting	1	02-9214
	Part	1" M-NPT/F-NPT 90d Fitting	1	02-9221
	Part	1" NPT PIPE NIPPLE	1	
	Part	1" M-ORB/F-NPT 90d Fitting	1	02-9210
B	Part	DVA35-MA8 4-Way Valve Section, SAE Port	1	10-9014
C	Part	M-ORB/JIC Long 90d 1" Fitting	2	02-9210
D	Part	DVA35-SA8 Valve Section	1	10-9015

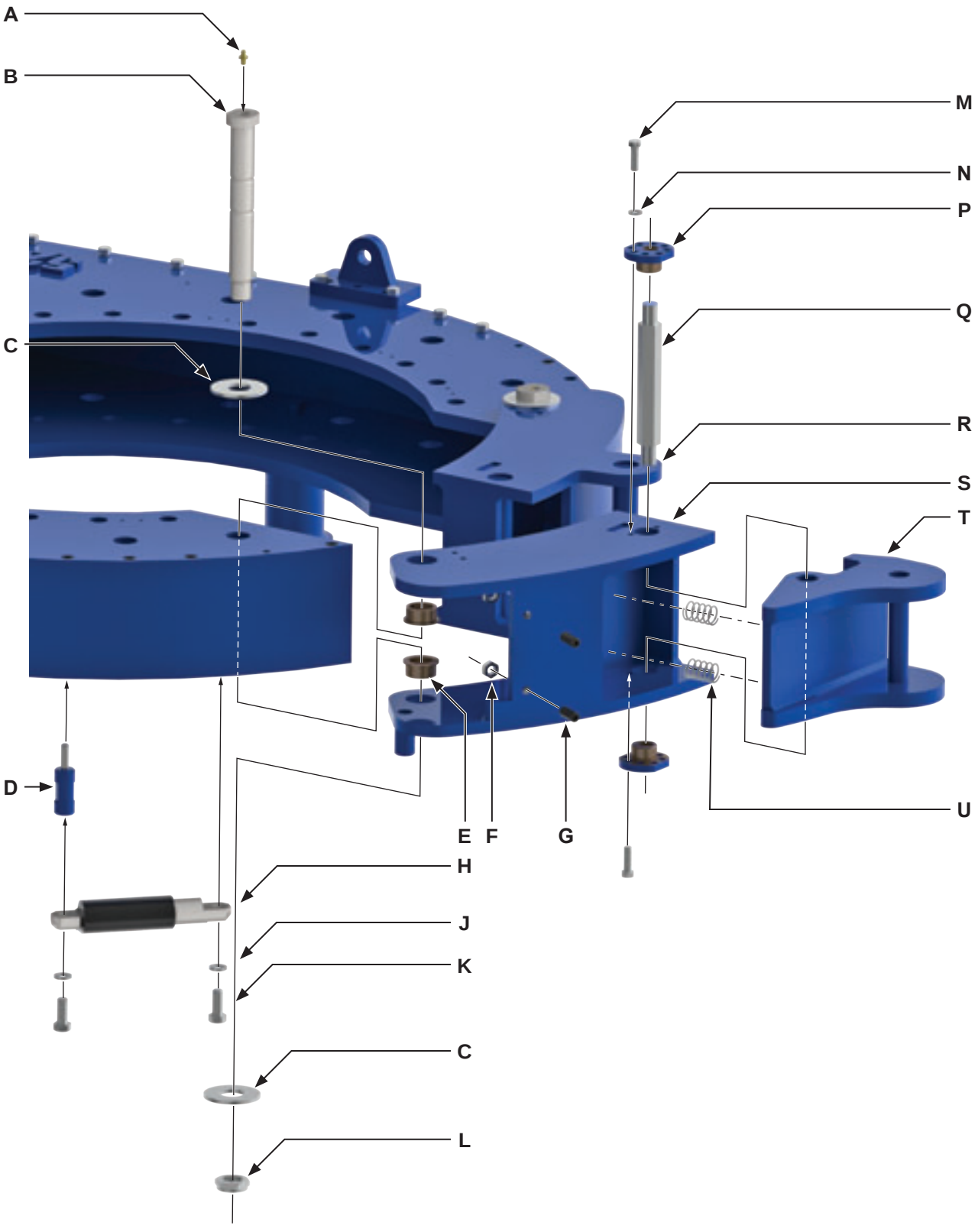
DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD



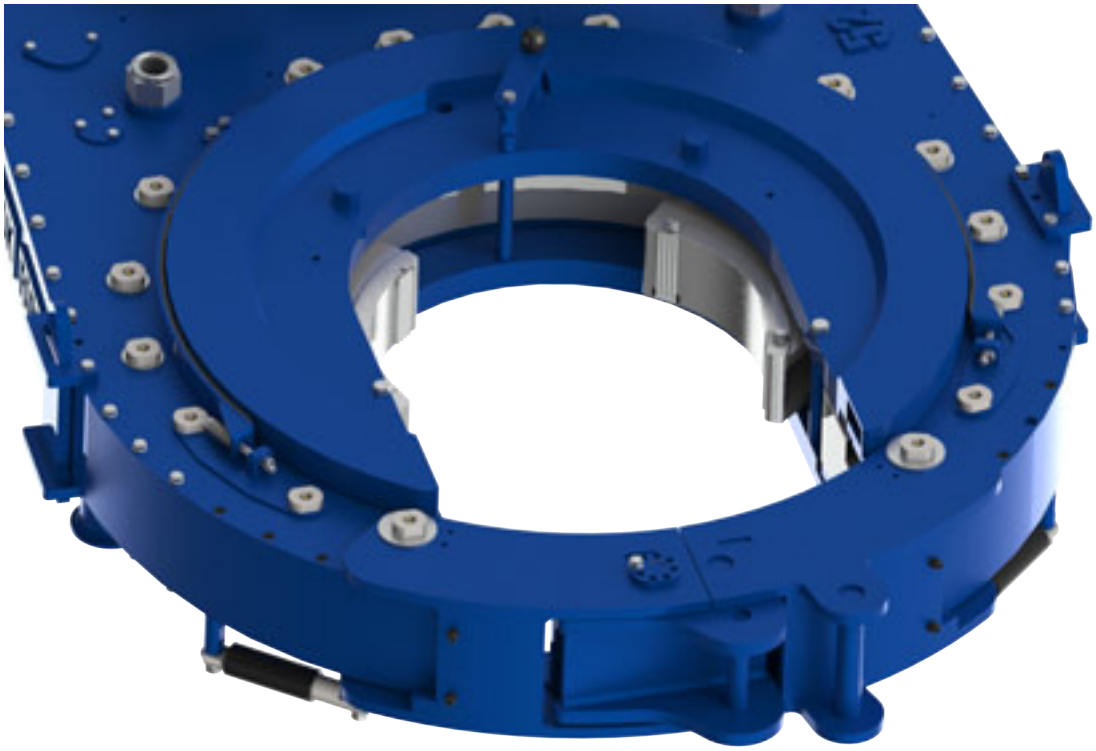
The hydraulic assembly on these pages are intended for use as a general assembly guide. For an exact listing of the hydraulic components in your system please refer to the hydraulic schematic, bill of materials, and hydraulic component identification guide in Section 2.

Item	Type	Description	Qty	Part Number
E	Part	Flow Control Valve (Lift Cylinder)	1	08-9062
F	Part	Outlet Section, DVA35-TR99	1	10-0086
G	Part	#20 Orb Plug With Machined #8 Orb Port Bushing	1	10-9068
H	Part	M-ORB/JIC 90 DEG 3/8" Fitting	1	02-9200
J	Assembly	1-1/4" Hydraulic Line (Return)	1	
	Part	1-1/4" Dust Cup	1	02-9212
	Part	1-1/4" Quick-Coupler Fitting	1	02-9215
	Part	1 1/4" M-NPT/F-NPT 45d Fitting	1	
	Part	1-1/4" NPT PIPE NIPPLE	1	
	Part	1-1/4" M-ORB/F-NPT 90d Fitting	1	02-9202
K	Part	1/2" NC x 6-1/2" Hex Bolt	4	09-1192
L	Part	1" Orb Plug Fitting	1	02-9222
M	Part	Inlet Section, DVA35-A880	1	10-9016
N	Part	Hydraulic Relief Valve, DVA35-MRV-2	1	10-0062
P	Assembly	Hydraulic Valve Handle Assembly (Motor Section)	1	101-4593
	Assembly	Hydraulic Valve Handle Assembly (Lift Section)	1	101-4586
	Part	Hydraulic Valve Handle (Motor Section)	1	101-4592
	Part	Hydraulic Valve Handle (Lift Section)	1	101-4587
	Part	Hydraulic Valve Handle Links	1	01-0409-LINK
	Part	Hydraulic Valve Pin #1	2	01-0409-PIN1
	Part	Hydraulic Valve Pin #2	1	01-0409-PIN2
	Part	C-Clip	2	01-0409-CIRCLIP
	Part	Cotter Pin	2	01-0409-COTTER

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

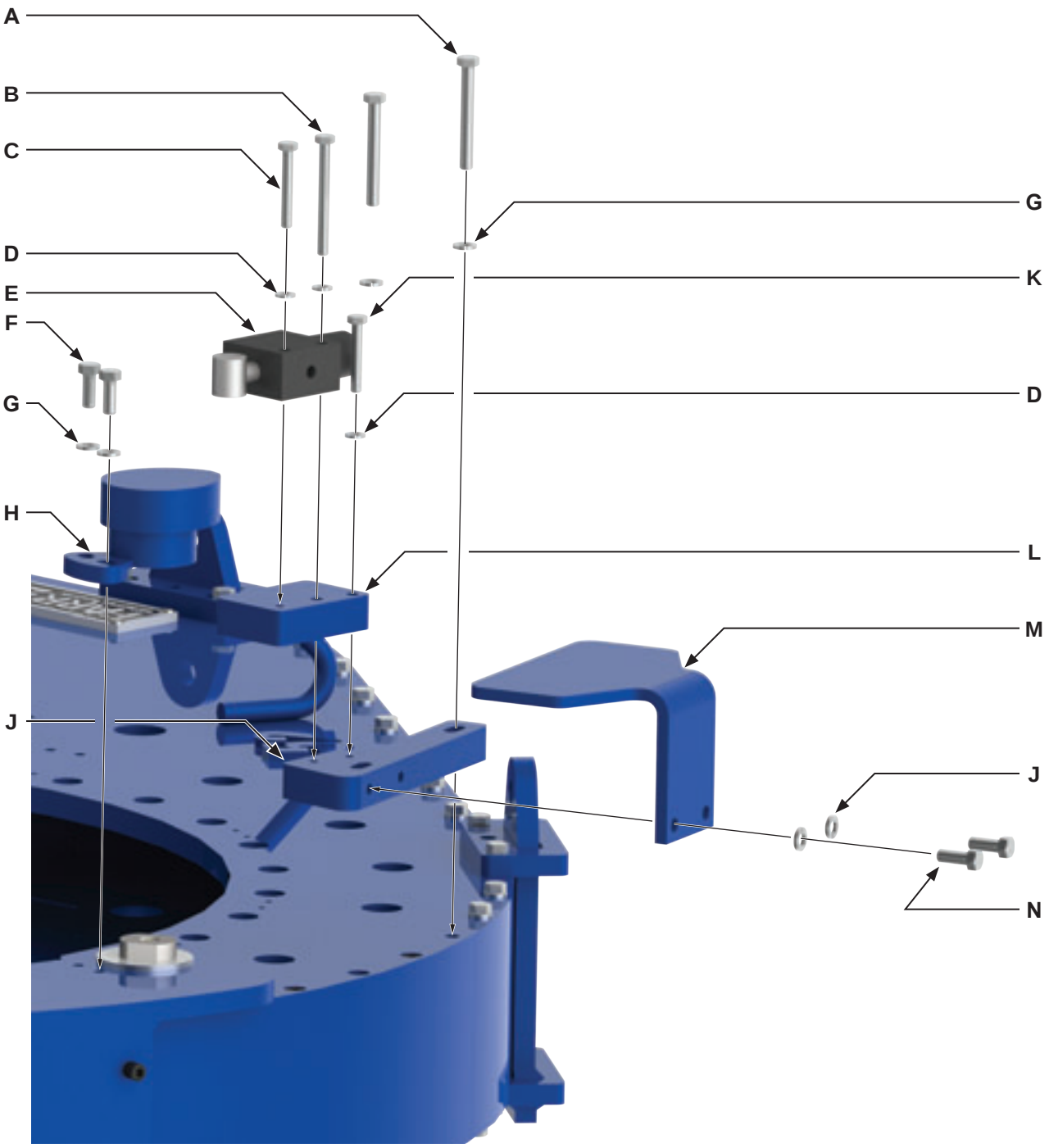


DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

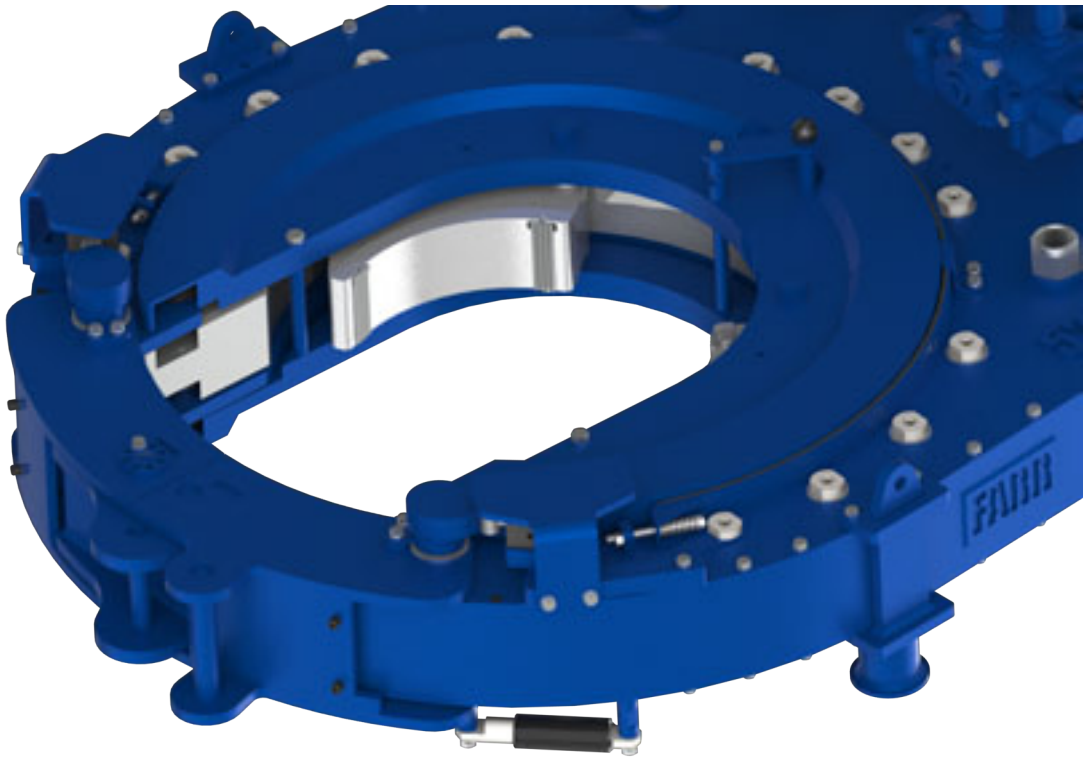


Item	Type	Description	Qty	Part Number
A	Part	1/4" NF Grease Fitting (Support Roller)	2	02-0097
B	Part	Door Pivot Roller Shaft (Support Roller)	2	101-3940
C	Part	1-1/8" Flatwasher	4	09-5041
D	Part	Door Cylinder Mounting Lug	2	101-0446
E	Part	Door Bushing	4	101-0110
F	Part	1/2" UNC Hex Jam Nut	4	09-5810
G	Part	Unbrako Flat Point 1/2" x 1-1/2" Set Screw	4	
H	Assembly	Door Cylinder Assembly	2	1037-A4-144
J	Part	1/2" Lockwasher	4	09-5110
K	Part	1/2" UNC x 1-1/4" Hex Bolt	4	09-2168
L	Part	1" UNS Thin Nylock Nut (Support Roller)	4	09-9167
M	Part	3/8" NC x 1-1/4" Hex Bolt	2	09-2048
N	Part	3/8" Regular Carbon Steel Lockwasher	2	09-5106
P	Part	Door Latch Cam	2	1037-C-151
Q	Part	Door Latch Shaft	1	1037-C-200
R	Weldment	LH Door Weldment	1	101-1697
S	Weldment	RH Door Weldment	1	101-1703
T	Weldment	Latch Weldment	1	101-1570
U	Part	Door Latch Spring	2	997-16

MCCOY | DRILLING & COMPLETIONS
FARR
MOVING GLOBAL ENERGY FORWARD

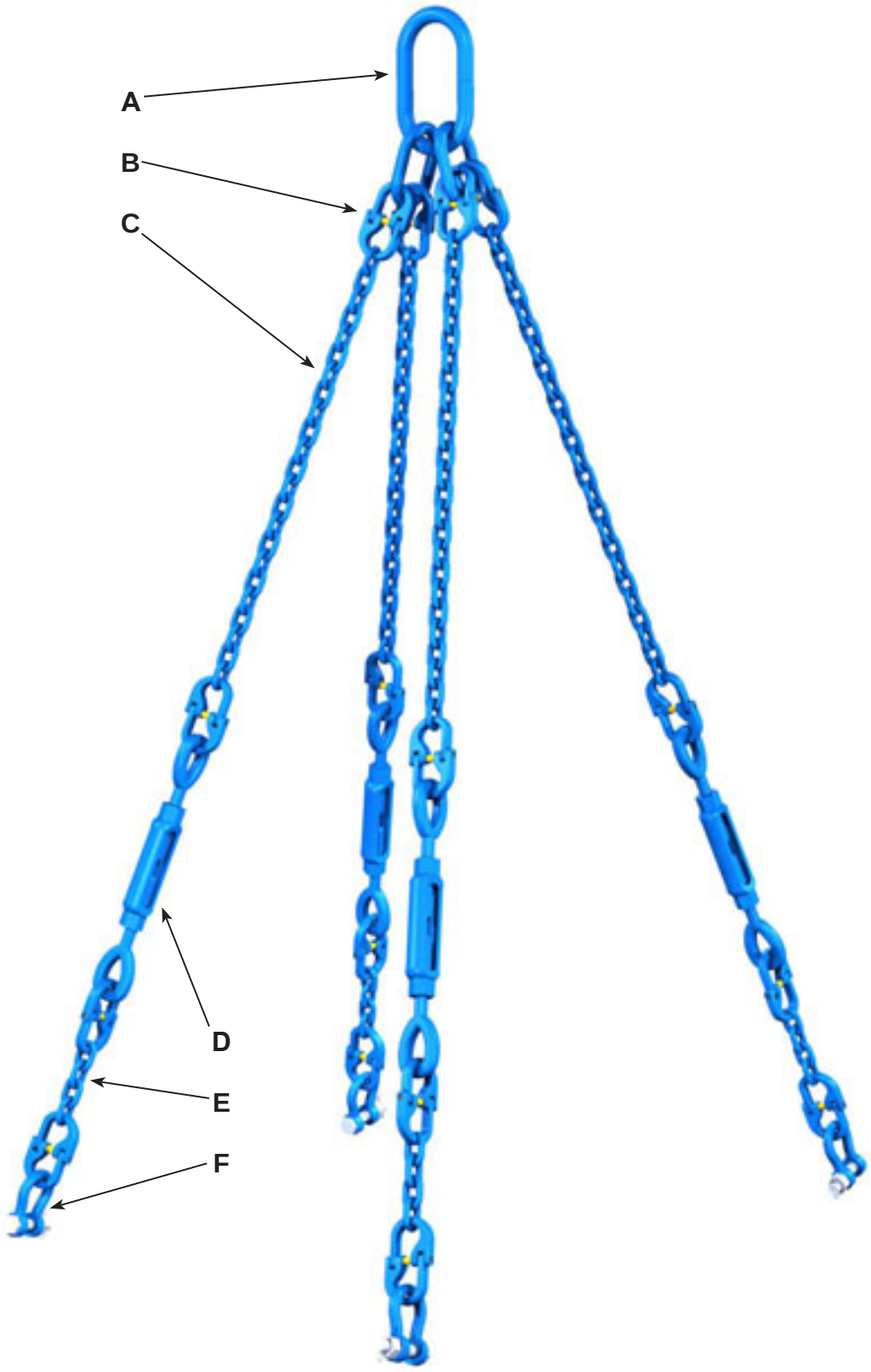


DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD



Item	Type	Description	Qty	Part Number
A	Part	3/8” UNC x 3” Hex Bolt	4	09-2058
B	Part	5/16” UNC x 3-1/4” Hex Bolt	2	09-2524
C	Part	5/16” UNC x 2-1/4” Hex Bolt	2	09-2523
D	Part	5/16” Lockwasher	6	09-5104
E	Part	Safety Door Valve	2	08-0121
F	Part	3/8” UNC x 1” Hex Bolt	4	09-1170
G	Part	3/8” Regular Carbon Steel Lockwasher	12	09-5106
H	Weldment	Safety Door Cam Weldment	2	101-1705
J	Part	Valve Mount Base Plate	2	101-1707
K	Part	5/16” NC x 2” Hex Bolt	2	09-1034
L	Part	Valve Mount Plate	2	101-1708
M	Part	Safety Door Valve Guard	2	101-0839
N	Part	3/8” NC x 1-1/4” Hex Bolt	4	09-1048

MCCOY | DRILLING & COMPLETIONS
MOVING GLOBAL ENERGY FORWARD
FARR



DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Item	Type	Description	Qty	Part Number
A	Part	Master Link	1	02-0517
B	Part	Hammer Lock Connector (4 per chain)	16	02-0607
C	Part	25 Link Chain Set (Front)	2	101-0377
	Part	23 Link Chain Set (Rear)	2	101-0376
D	Part	Turnbuckle	4	02-6506
E	Part	4 Link Chain Set	4	101-0378
F	Part	Shackle Assembly	4	02-9063

ALL FASTENERS USED DURING REASSEMBLY OF LOAD-BEARING COMPONENTS (CHAIN SLINGS, RIGID SLINGS, BACKUP LEGS) MUST BE TIGHTENED TO THE CORRECT TORQUE. THREADED FASTENERS USED IN LOAD-BEARING DEVICES MUST BE SECURED WITH RED LOCTITE™.

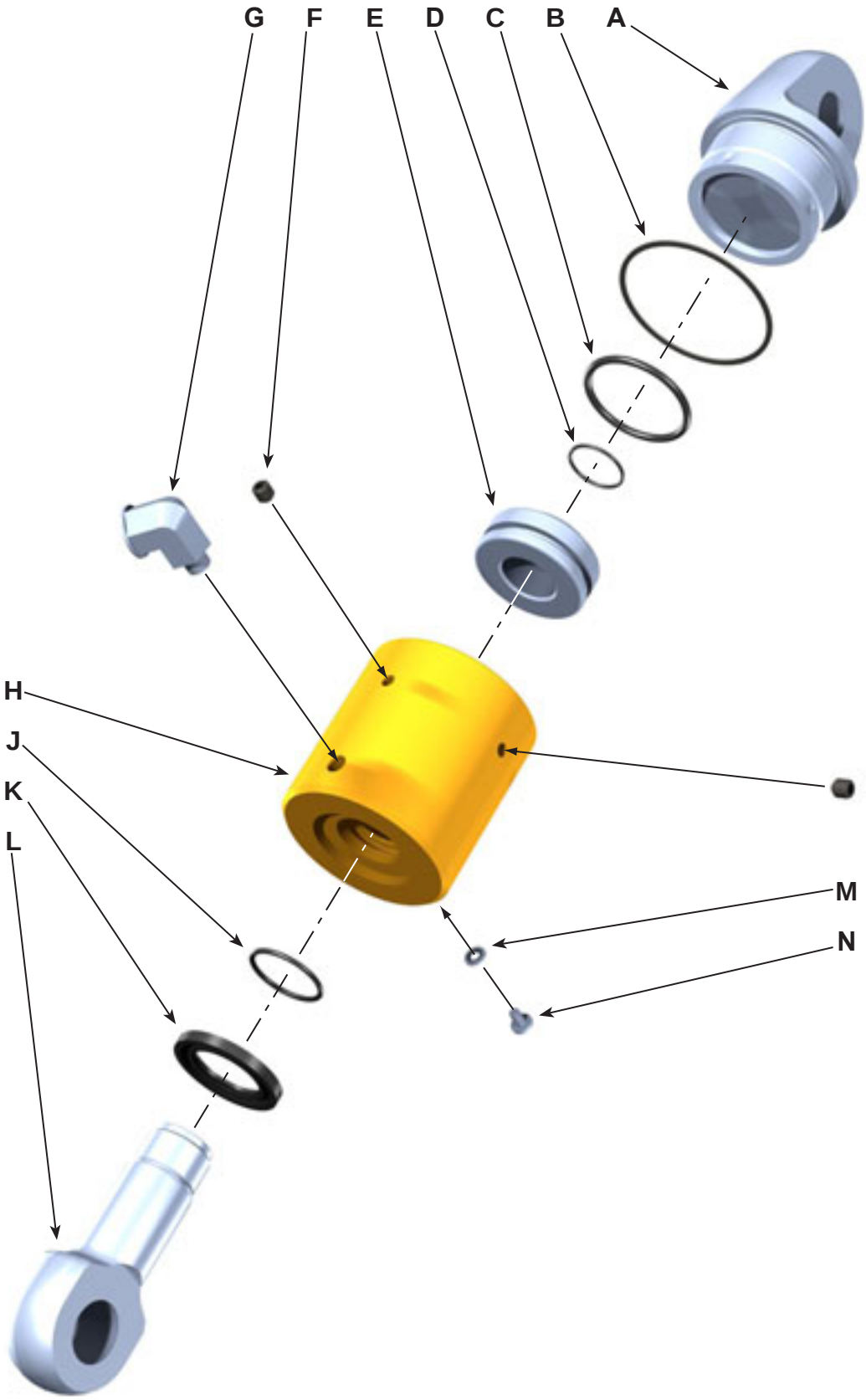
MCCOY DRILLING & COMPLETIONS
MOVING GLOBAL ENERGY FORWARD
FARR

This page intentionally left blank

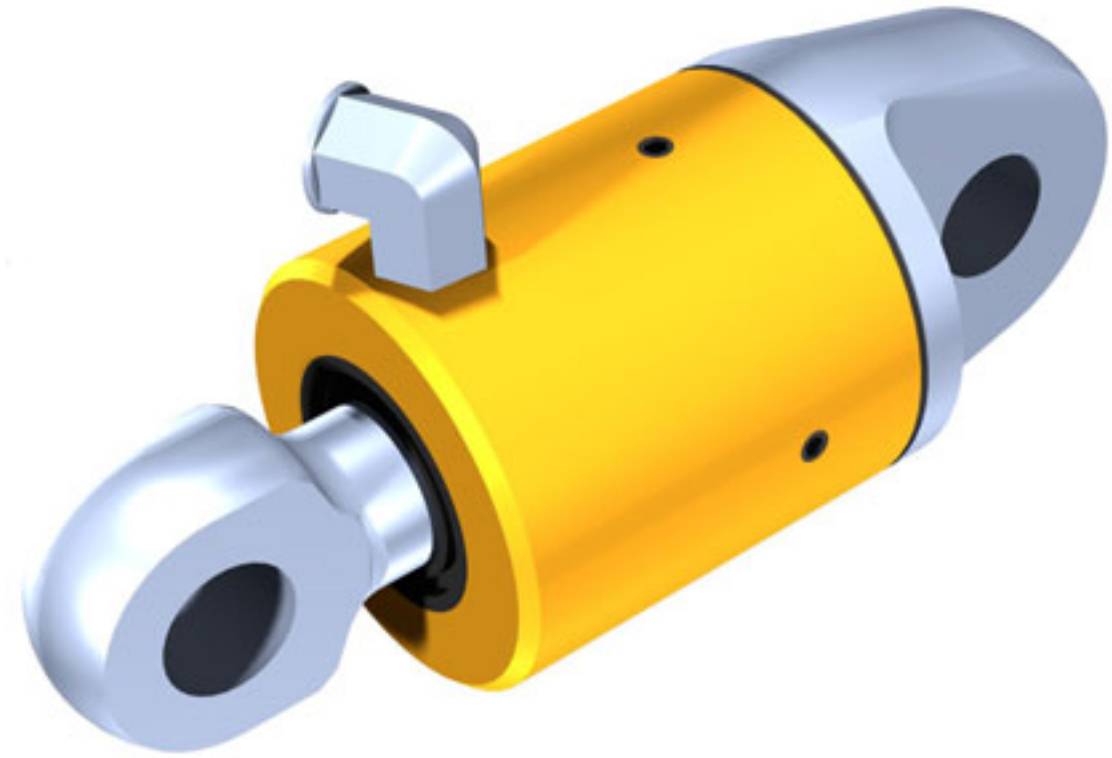
This is the typical load cell and torque gauge sold with this tong. Torque measurement systems in different ranges for this torque arm up to the maximum rated torque are available - contact our sales office for more information.

Item Type	Description	Qty	Part Number
Assembly	*Load Cell / Torque Gauge Assembly 52" Torque Arm, 60000 Ft.-Lbs. Gauge Face*	*1*	
Part	*Tension Load Cell, 4.08 in^2*	*1*	*10-0008T*
Part	*Torque Gauge, 0 - 60,000 ft.-lbs.*	*1*	*10-0023G*
Part	*Tie-Off Shackle Assembly*	*2*	*101-0078*
Part	*Hose Assembly*	*1*	*02-0069*

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD



DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD



Item	Type	Description	Qty	Part Number
	Assembly	Tension Load Cell, 4.08 in^2	1	10-0008T
A	Part	Load Cell End	1	LC99-003
B	Part	Flange Gasket	1	02-0073
C	Part	O-Ring	1	02-0350
D	Part	O-Ring	1	08-0596
E	Part	Load Cell Piston	1	LC99-101
F	Part	3/8" NC x 3/8" Cup Point Hex Set Screw	2	09-2011
G	Part	1/4" MNPT x 3/8" FNPT Street Elbow	1	08-0023
H	Part	Load Cell Body	1	LC99-104
J	Part	O-Ring	1	02-0800
K	Part	Wiper	1	08-1558
L	Part	Load Cell Rod	1	LC99-002
M	Part	Stat-O-Seal	1	02-0307
N	Part	1/4" NC x 1/2" Cross Recessed Binding Head Machine Screw	1	09-0045A

MCCOY DRILLING & COMPLETIONS
MOVING GLOBAL ENERGY FORWARD
FARR

A. TROUBLESHOOTING

Under normal operating conditions, and with proper maintenance, the torque gauge and load cell system are designed to give lasting trouble-free performance. Faulty indication on the gauge will very often define a fault within the gauge.

IF TROUBLESHOOTING REVEALS THAT THERE IS INSUFFICIENT FLUID IN THE SYSTEM, BEFORE RECHARGING, CHECK THAT ALL SYSTEM COMPONENTS ARE FREE FROM DAMAGE. THIS WILL ENSURE THAT FLUID LOSS WILL NOT CONTINUE AFTER RELOADING

1.	PROBLEM:	No indication on gauge.
	POSSIBLE SOLUTIONS:	Obstruction in hose.
		Loss of hydraulic fluid.
		Gauge internal mechanism damaged.
2.	PROBLEM:	Gauge indication too high.
	POSSIBLE SOLUTIONS:	Excessive hydraulic fluid.
		Internal mechanism of gauge is damaged.
3.	PROBLEM:	Gauge indication too low.
	POSSIBLE SOLUTIONS:	Insufficient hydraulic fluid.
		Snub line not at right-angle to tong handle.
		Gauge internal mechanism damaged.
4.	PROBLEM:	Erratic or sluggish gauge indication.
	POSSIBLE SOLUTIONS:	Pointer rubbing glass or dial.
		Insufficient hydraulic fluid.
		Dirty gauge movement.
		Improper pointer damper adjustment.
		Gauge internal mechanism damaged.

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

B. PERIODIC INSPECTION AND MAINTENANCE

1. Inspection

Tong Torque Systems are built to give years of trouble-free service with minimum maintenance. Periodic inspections of the load cell, and hydraulic lines and fittings, are recommended in order to keep the system in top operating condition. A thorough inspection should be made at each rig-up.

2. Fluid Recharge

Recharge hydraulic system with W15/16 fluid via the filling connection at the top of the indicating gauge. Recharging must only be performed when there is no load on the load cell:

a. Connect hand pump to filling connection on gauge.

b. Fill hand pump bowl with W15/16 hydraulic fluid and pump fluid into the system until the piston rod on the load cell extends no more than 1/2" from the body.

c. Loosen vent screw on load cell body to permit trapped air to escape during loading.

MAINTAIN GREATER-THAN HALF FULL FLUID LEVEL IN THE HAND PUMP BOWL TO AVOID PUMPING AIR INTO THE SYSTEM. DO NOT ALLOW THE LEVEL TO FALL BELOW ONE-HALF FULL

d. Retighten load cell vent screw when the system has been adequately recharged

3. Repair And Calibration

Load cell and indicator gauge should be returned to authorized repair facility for any repairs or calibration required.

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

This page intentionally left blank

Kawasaki Motors Corp., U.S.A.
Precision Machinery Division

HMB 080

Staffa Fixed Displacement Hydraulic Motor

MCCOY DRILLING & COMPLETIONS
MOVING GLOBAL ENERGY FORWARD
FARR

CONTENTS

Page

1. General Description 2
2. Functional Symbols 2
3. Model Code 3
4. Performance Data:
   - Motor data 4
   - Rating definitions 4
   - Output torques 4
   - Bearing life 5
   - Volumetric efficiency 6
5. Circuit and Application Notes:
   - Starting torques 6
   - Low speed operation 6
   - High back pressure 6
   - Boost pressure 6
   - Cooling flow 6
   - Motor casing pressure 7
6. Hydraulic Fluids 7
7. Temperature Limits 7
8. Filtration 7
9. Noise Levels 7
10. Polar Moment of Inertia 7
11. Mass 7
12. Installation Data:
    - General 7
    - Crankcase drain 7
    - Start-up 7
13. Installation Dimensions ..... 8 to 11

1. GENERAL DESCRIPTION

The HMB080 fixed displacement motor is one of 12 frame sizes in the Kawasaki "Staffa" range of high torque, low speed radial piston motors which extends from 94 to 6800 cm^3/r (5.76 to 415 in^3/r) capacity. The rugged, well-proven design incorporates hydrostatic balancing techniques to achieve high efficiency, combined with good breakout torque and smooth running capability.

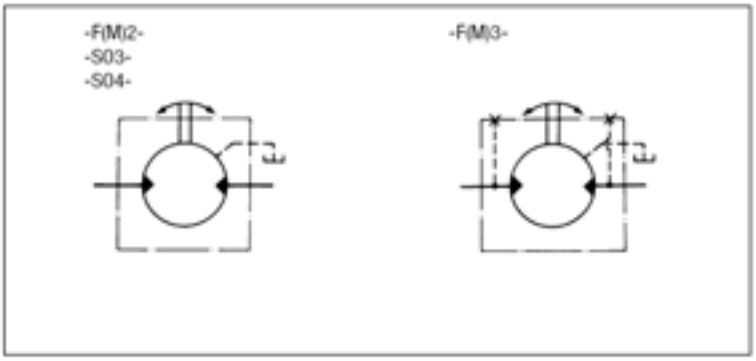
Various features and options are available including, on request, mountings to match competitor interfaces.

The HMB080 is capable of torque outputs up to 5950 Nm (4390 lbf ft) and speeds to 300 r/min with a continuous output of up to 100 kW (134 hp).

The Kawasaki "Staffa" range also includes dual and continuously variable displacement motors, plus matching brakes and gearboxes to extend the available torque range.

2. FUNCTIONAL SYMBOLS

All model types with variants in model code position **4**



DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

3. MODEL CODE

Features shown in brackets ( ) may be left blank according to requirements.
All other features must be specified.

(F)-HM(*)B080-(H)*(V)-**-(**)-3*-(PL**)**

1 **2** **3** **4** **5** **6** **7**

1 FLUID TYPE

Blank = Petroleum oil
F3 = Phosphate ester (HFD fluid)
F11 = Water-based fluids (HFA, HFB and HFC)

2 MODEL TYPE

Blank = Standard ("HMB")
M = To NCB (UK) specification 463/1981 ("HMMB")
R = Dual mount (front or rear)

3 SHAFT TYPE

Use "H" prefix code as noted to specify "hollow" shafts with through hole Ø 26,2 (1.03 dia).
Hollow shafts are available only with type "S04" main port connection.
(H)P* = Cylindrical shaft with key
(H)S* = Cylindrical, 14 splines to BS 3550
(H)Z* = Cylindrical shaft to DIN 5480 (W70 x 3 x 22 x 7h)
(H)Q* = Female, 24 splines to BS 3550
T* = Long tapered, keyed shaft
X* = Short tapered, keyed shaft

* *For installations where shaft is vertically upwards specify "V" after shaft type letter to ensure that additional high level drain port is provided.*

4 MAIN PORT CONNECTIONS

Models with 2¼" distributor valve▲
F2◆ = SAE 1", 4-bolt (UNC) flanges
FM2◆ = SAE 1", 4-bolt (metric) flanges
Models with 3" distributor valve
S03 = 6-bolt (UNF) flange (Staffa original valve housing)
F3 = SAE 1¼", 4-bolt (UNC) flanges
FM3 = SAE 1¼", 4-bolt (metric) flanges
Models with 4" distributor valve■
Must be specified when requiring hollow shafts, type HP, HS, HZ or HQ
S04■ = 6 bolt (UNF) flange (Staffa original valve housing)

▲ *Gives minimum overall length of HMB080 motor*
◆ *Max. inlet flow 200 l/min (53 USgpm); reduced max. continuous speed and output power, see "Performance Data", page 4.*
■ *Obligatory for hollow shafts. See increased installation dimensions with 4" valve.*

5 TACHO/ENCODER DRIVE

T = Staffa original tacho drive
T1 = Suitable for Hohner 3000 series encoders. (Encoder to be ordered separately)
Omit if not required and when specifying shaft types "H**"

6 DESIGN NUMBER, 3* SERIES

Subject to change. Installation and performance details remain unaltered for design numbers 30 to 39 inclusive.

7 SPECIAL FEATURES

PL** = non-catalogued features, e.g.:
Stainless steel shaft sleeves
Alternative encoder and tacho drives
Alternative port connections
Shaft variants
Alternative reduced capacities
Special mountings
Special paint

** *Number assigned as required to specific customer build.*

DRILLING & COMPLETIONS | FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

4. PERFORMANCE DATA

Performance data is valid for Staffa HMB080 motors fully run in and operating with petroleum oil. See separate table for pressure and speed limits when using fire-resistant fluids. Leakage values are at fluid viscosity of 50 cSt (232 SUS).

MOTOR DATA

		Port connection type, see model code 4 S03, F3, FM3, S04	F2, FM2
Geometric displacement▲	cm^3/r (in^3/r)	1344 (82)	1344 (82)
Average actual running torque	Nm/bar (lbf ft/psi)	19,9 (1.01)	19,9 (1.01)
Max. continuous◆speed	r/min	300	150
Max. continuous◆output	kW (hp)	100 (134)	77 (103)
Max. continuous◆pressure	bar (psi)	250 (3625)	250 (3625)
Max. intermittent◆pressure	bar (psi)	293 (4250)	293 (4250)

▲ *Other lower displacements are made available to special order*
◆ *See "Rating Definitions", this page*

LIMITS FOR FIRE RESISTANT FLUIDS

Fluid type	Pressure, bar (psi) Continuous	Intermittent	Max. speed r/min
HFA, 5/95% oil-in-water emulsion	103 (1500)	138 (2000)	50% of limits for petroleum oil
HFB, 60/40% water-in-oil emulsion	138 (2000)	172 (2500)	As for petroleum oil
HFC, water glycol	103 (1500)	138 (2000)	50% of limits for petroleum oil
HFD, phosphate ester	250 (3625)	293 (4250)	As for petroleum oil

RATING DEFINITIONS

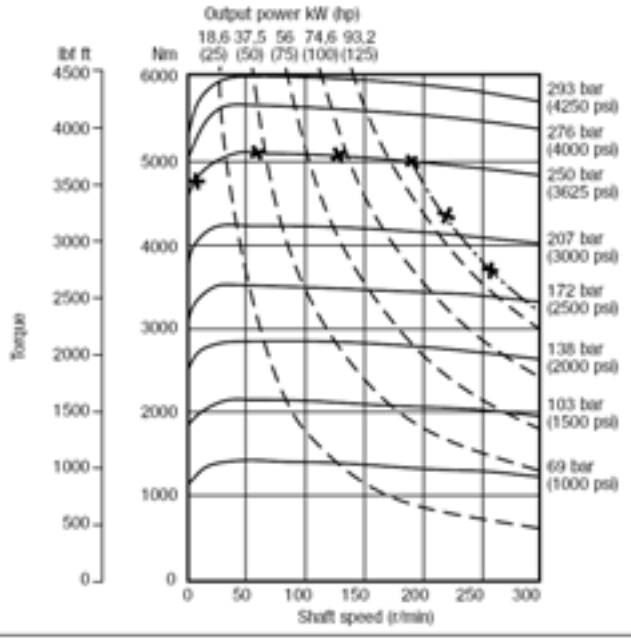
● CONTINUOUS RATING
For continuous duty the motor must be operating within each of the maximum values for speed, pressure and power.

● INTERMITTENT RATING
Operation within the intermittent power rating (up to the maximum continuous speed) is permitted on a 15% duty basis, for periods up to 5 minutes maximum.

● INTERMITTENT MAX. PRESSURE
Up to 293 bar (4250 psi) is allowable on the following basis:
(a) Up to 50 r/min: 15% duty for periods up to 5 minutes maximum.
(b) Over 50 r/min: 2% duty for periods up to 30 seconds maximum.

OUTPUT TORQUES

The torque curves indicate the maximum output torque and power of a fully run-in motor for a range of pressures and speeds when operating with zero outlet pressure on petroleum oil of 50 cSt (232 SUS) viscosity. High return line pressures will reduce torque for a given pressure differential.

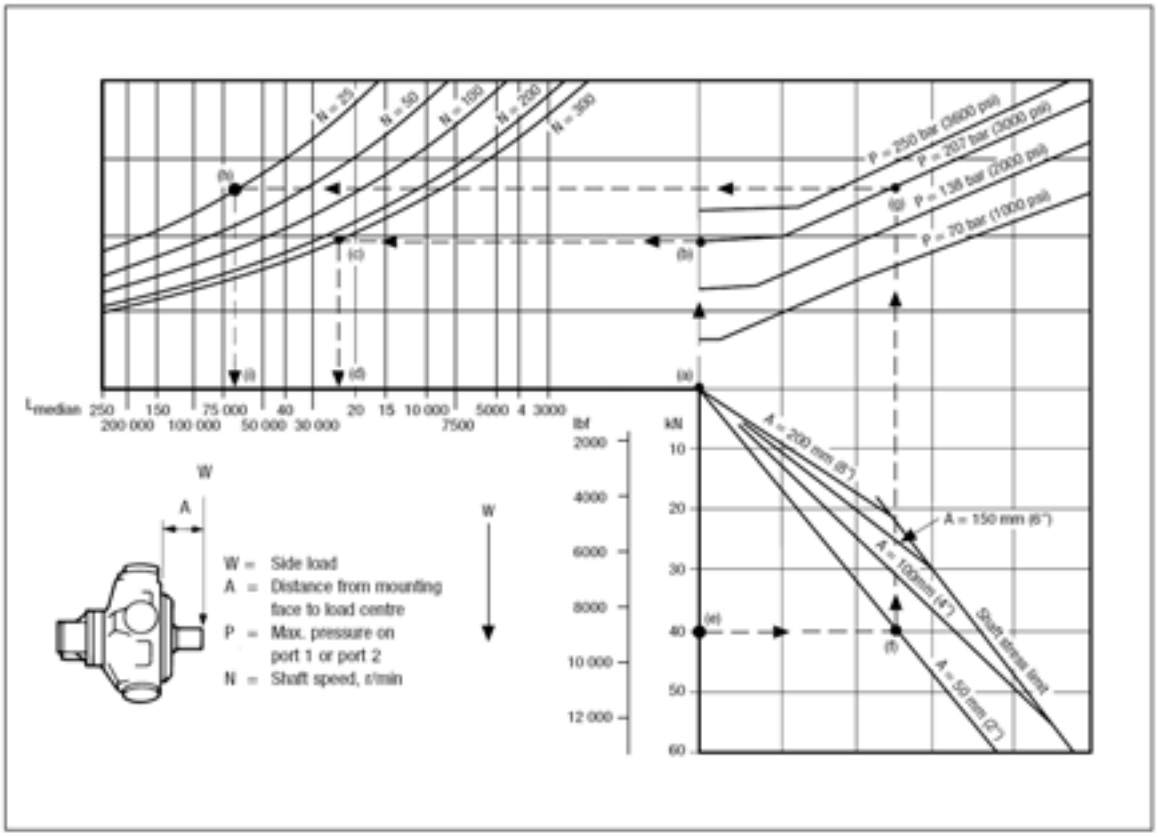


Upper limit of continuous rating envelope, see "Rating definitions" above.

4

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

BEARING LIFE



The nomograph allows the median ▲ bearing life to be determined for conditions of:

1. No side load and no axial thrust
2. Side load and no axial thrust

▲ *To determine L10 life predictions per ISO 281-1-1977 multiply the median figure by 0.2.*

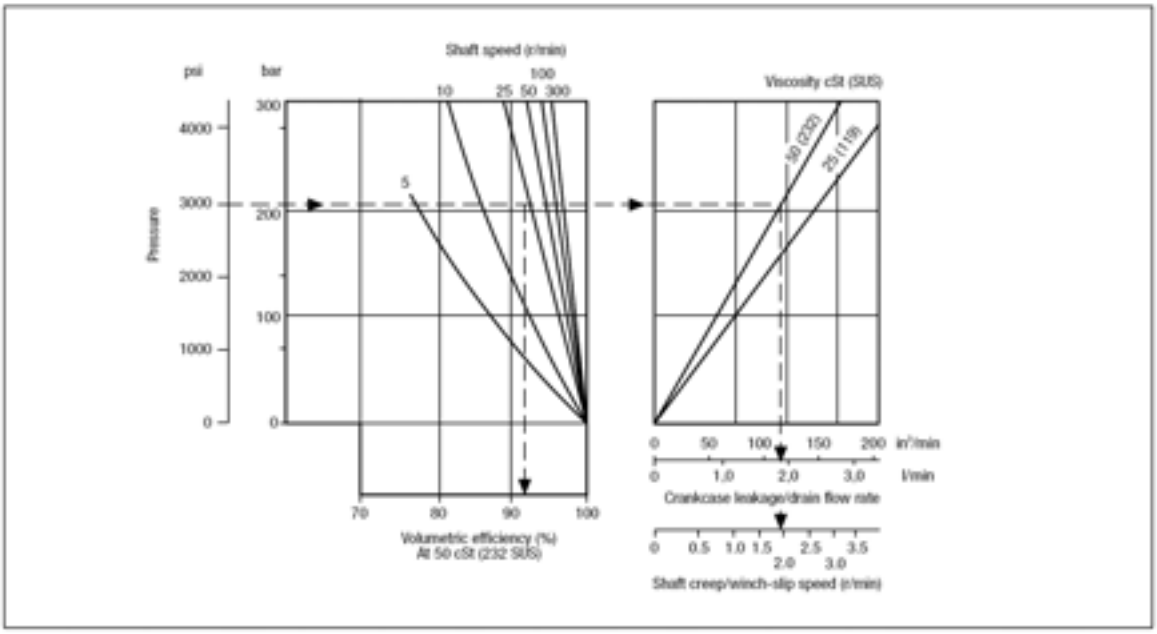
	HMB080
Example 1 (follow chain dotted line):	
Side load (W)	a) 0
System pressure (P)	b) 207 bar (3000 psi)
Speed (N)	c) 300 r/min
Median bearing life	d) 23 000 hrs
L10 bearing rating = median x 0.2	4600 hrs
Example 2 (follow chain dotted line):	
Side load (W)	e) 40 kN (9000 lbf)
Load offset (A) from motor mounting face	f) 50 mm (2.0 in)
System pressure (P)	g) 207 bar (3000 psi)
Speed (N)	h) 25 r/min
Median bearing life	i) 62 000 hrs
L10 bearing rating = median x 0.2	12 400 hrs

For more precise life prediction, or where axial thrusts are incurred, a computer analysis can be provided by Kawasaki on receipt of machine duty cycle.

● SHAFT STRESS LIMIT
The shaft stress limit in the nomograph is based on the fatigue rating of shaft types "(H)S" and "(H)P". Infrequent loading above these limits may be permitted; consult Kawasaki.

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

VOLUMETRIC EFFICIENCY



This nomograph enables the average volumetric efficiency, crankcase (drain) leakage and "winch slip"/shaft creep speed to be estimated.

Example (follow chain dotted line):
Given:
1. Pressure ..... 207 bar (3000 psi)
2. Speed ..... 25 r/min
3. Viscosity ..... 50 cSt (232 SUS)

To obtain:
4. Volumetric efficiency 91.8%
5. Crankcase leakage ..... 1,9 l/min (115.0 in³/min)
6. Shaft creep speed ..... 1.9 r/min

The shaft creep speed occurs when the load attempts to rotate the motor against closed ports as may occur, for example, in winch applications.

5. CIRCUIT AND APPLICATION NOTES

STARTING TORQUES
The starting torques shown on the graph on page 4 are average and will vary with system parameters.

LOW SPEED OPERATION
Minimum operating speeds are determined by load conditions (load inertia, drive elasticity, etc.). For operation at speeds below 3 r/min consult Kawasaki.

HIGH BACK PRESSURE
When both inlet and outlet ports are pressurized continuously, the lower pressure in one port must not exceed 70 bar (1000 psi). Consult Kawasaki on applications beyond this limit. Note that high back pressures reduce the effective torque output of the motor.

BOOST PRESSURE
When operating as a motor the outlet pressure should equal or exceed the crankcase pressure. If pumping occurs (i.e. overrunning loads) then a positive pressure, "P", is required at the motor inlet ports. Calculate "P" according to port connection type being used, from:

$$P\ (bar) = 1 + \frac{N^2}{D_{bar}} + C\ bar$$

$$P\ (psi) = 14.5 + \frac{N^2}{D_{psi}} + C\ psi$$

Where:
N = speed, r/min
C = crankcase pressure
D = see table

Port connection type	D value
F2 & FM2	$D_{bar} = 1500$ $D_{psi} = 103$
S03, S04 F3, FM3	$D_{bar} = 10\ 000$ $D_{psi} = 690$

The flow rate of oil needed for the make-up system can be estimated from the crankcase leakage figure (see Volumetric Efficiency graph above). Allowance should be made for other system losses and also for "fair wear and tear" during the life of the motor, pump and other system components.

COOLING FLOW
Operation within the continuous ratings does not require any additional cooling.

For operating conditions above "continuous", up to the "intermittent" ratings, additional cooling oil may be required. This can be introduced through the spare crankcase drain hole or, in special cases, through the valve spool end cap. Consult Kawasaki about such applications.

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

MOTOR CASING PRESSURE
With the standard shaft seal fitted, the motor casing pressure should not exceed 3,5 bar (50 psi). On installations with long drain lines a relief valve is recommended to prevent over-pressurizing the seal.

Notes:
1. *The casing pressure at all times must not exceed either the motor inlet or outlet pressure.*
2. *High pressure shaft seals are available to special order for casing pressures of:*
   Continuous: 10 bar (150 psi)
   Intermittent: 15 bar (225 psi)
3. *Check installation dimensions (page 8) for maximum crankcase drain fitting depth.*

6. HYDRAULIC FLUIDS

Dependent on motor (see Model Code position 1) suitable fluids include:
- Antiwear hydraulic oils
- Phosphate esters (HFD fluids)
- Water glycols (HFC fluids) ▲
- 60/40% water-in-oil emulsions (HFB fluids) ▲
- 5/95% oil-in-water emulsions (HFA fluids) ▲

▲ *Reduced pressure and speed limits, see page 4.*

Viscosity limits when using any fluid except oil-in-water (5/95%) emulsions are:

Max. off load	2000 cSt (9270 SUS)
Max. on load	150 cSt (695 SUS)
Optimum	50 cSt (232 SUS)
Minimum	25 cSt (119 SUS)

PETROLEUM OIL RECOMMENDATIONS
The fluid should be a good hydraulic grade, non-detergent petroleum oil. It should contain anti-oxidant, anti-foam and demulsifying additives. It must contain antiwear or EP additives. Automatic transmission fluids and motor oils are not recommended.

7. TEMPERATURE LIMITS

Ambient min.	-30°C (-22°F)
Ambient max.	+70°C (158°F)

Max. operating temperature range

	Petroleum oil	Water-containing
Min.	-20°C (-4°F)	+10°C (50°F)
Max.*	+80°C (175°F)	+54°C (130°F)

* *To obtain optimum service life from both fluid and hydraulic system components 65°C (150°F) normally is the maximum temperature except for water-containing fluids.*

8. FILTRATION

Full flow filtration (open circuit), or full boost flow filtration (closed circuit) to ensure system cleanliness of ISO 4406/1986 code 18/14 or cleaner.

9. NOISE LEVELS

The airborne noise level is less than 66,7 dB(A) DIN (70 dB(A) NFPA) throughout the "continuous" operating envelope.

Where noise is a critical factor, installation resonances can be reduced by isolating the motor by elastomeric means from the structure and the return line installation. Potential return line resonances originating from liquid borne noise can be further attenuated by providing a return line back pressure of 2 to 5 bar (30 to 70 psi).

10. POLAR MOMENT OF INERTIA

Typical data: 0,06 kg m² (210 lb in²).

11. MASS

Approx., all models: 144 kg (317 lb).

11. INSTALLATION DATA

GENERAL

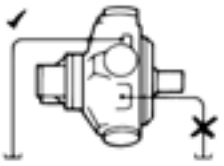
● Spigot
The motor should be located by the mounting spigot on a flat, robust surface using correctly sized bolts. The diametral clearance between the motor spigot and the mounting must not exceed 0,15 mm (0.006 in). If the application incurs shock loading, frequent reversing or high speed running, then high tensile bolts should be used, including one fitted bolt.

● Bolt torque
The recommended torque wrench settings for the mounting bolts are:
M20 bolts....407±14 Nm (300±10 lbf ft)
¾" bolts.....393±14 Nm (290±10 lbf ft)

● Shaft coupling
Where the motor is solidly coupled to a shaft having independent bearings the shafts must be aligned to within 0,13 mm (0.005 in) TIR.

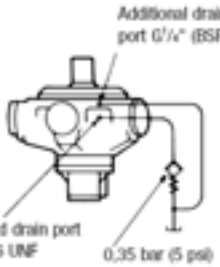
CRANKCASE DRAIN

Motor axis horizontal



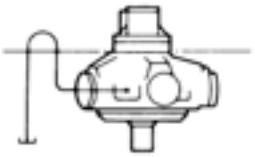
The crankcase drain must be taken from a position above the horizontal centre line of the motor.

Axis vertical, shaft up



An additional G¼" (BSPF) drain port is provided when the "V" (shaft vertically upwards) designator is given after the shaft type letter in position 3 of the model code. This additional drain should be connected into the main motor casing drain line downstream of a 0,35 bar (5 psi) check valve to ensure lubrication of the upper bearing, see above diagram.

Axis vertical, shaft down



Use any drain position. The drain line should be run above the level of the uppermost bearing; if there is risk of siphoning then a siphon breaker should be fitted.

START-UP
Fill the crankcase with system fluid. Where practical, a short period (30 minutes) of "running-in" should be carried out.

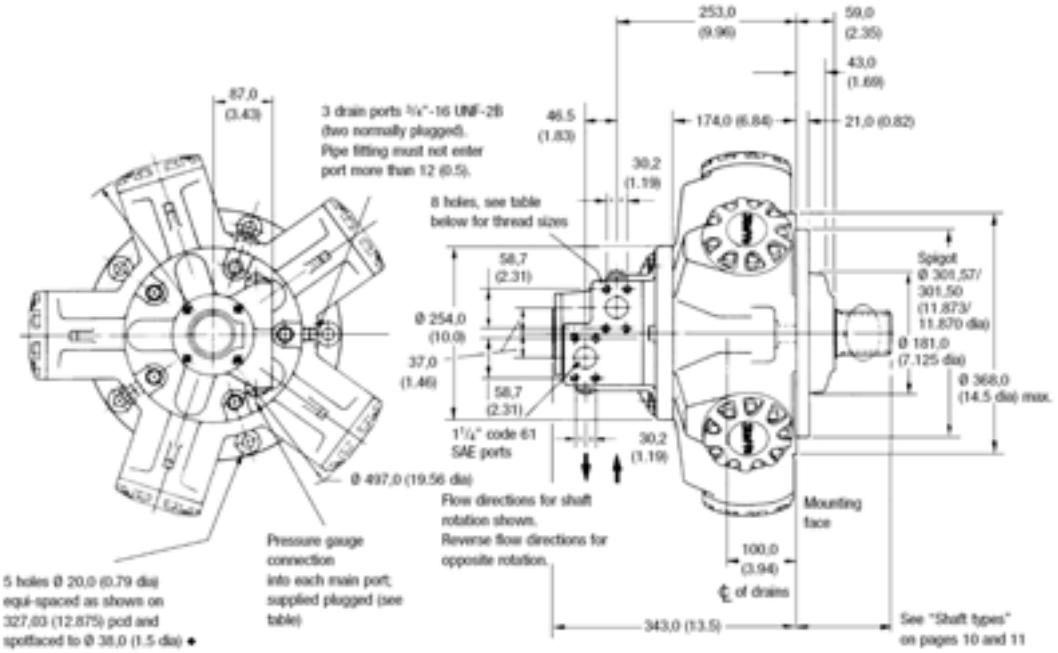
DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

13. INSTALLATION DIMENSIONS IN MM (INCHES)

FRONT-MOUNTING MODELS
HMB080 MOTORS WITH TYPE "F3"/"FM3" (1¼" SAE) PORT CONNECTION

3rd angle projection

See separate drawing for dual-mount model.
See additional views for shaft types and for types "S03" and "S04" port connection.
See drawing of dual-mount model for details of types "F2" and "FM2" port connection.


253,0 (9.96)
59,0 (2.35)
43,0 (1.69)
87,0 (3.43)
3 drain ports ¾"-16 UNF-2B (two normally plugged). Pipe fitting must not enter port more than 12 (0.5).
46,5 (1.83)
174,0 (6.84)
21,0 (0.82)
30,2 (1.19)
8 holes, see table below for thread sizes
58,7 (2.31)
Spigot Ø 301,57/ 301,50 (11.873/ 11.870 dia)
Ø 254,0 (10.0)
37,0 (1.46)
Ø 181,0 (7.125 dia)
Ø 368,0 (14.5 dia) max.
58,7 (2.31)
1¼" code 61 SAE ports
30,2 (1.19)
Ø 497,0 (19.56 dia)
Flow directions for shaft rotation shown. Reverse flow directions for opposite rotation.
Mounting face
100,0 (3.94)
℄ of drains
5 holes Ø 20,0 (0.79 dia) equi-spaced as shown on 327,03 (12.875) pcd and spotfaced to Ø 38,0 (1.5 dia) ◆
Pressure gauge connection into each main port, supplied plugged (see table)
343,0 (13.5)
See "Shaft types" on pages 10 and 11

Port flange bolt tappings

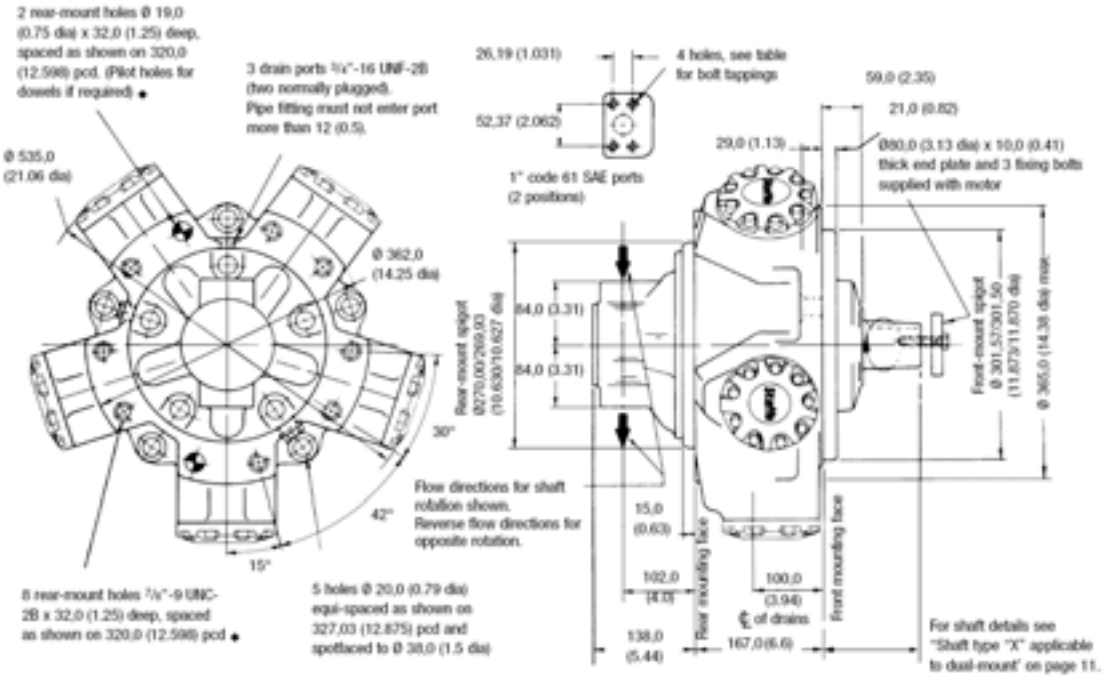
Model code 4	Tapping size	Gauge connections
F3	7/16"-14 UNC-2B x 27,0 (1.06) full thread depth	9/16"-18 UNF-2B, SAE J475
FM3	M12 x P1.75 x 27,0 (1.06) full thread depth	G¼" (BSPP)

◆ ⌖ Ø 0,15 (0.006)

8

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

DUAL-MOUNT MODELS
HMRB080 MOTORS WITH TYPE "F2"/"FM2" (1" SAE) PORT CONNECTION
See additional views for shaft types and for types "S03" and "S04" port connection.
See drawing of front-mount model for details of types "F3" and "FM3" port connection.


2 rear-mount holes Ø 19,0 (0.75 dia) x 32,0 (1.25) deep, spaced as shown on 320,0 (12.598) pcd. (Pilot holes for dowels if required) ◆
3 drain ports ¾"-16 UNF-2B (two normally plugged). Pipe fitting must not enter port more than 12 (0.5).
Ø 535,0 (21.06 dia)
Ø 362,0 (14.25 dia)
30°
42°
15°
8 rear-mount holes ⅞"-9 UNC-2B x 32,0 (1.25) deep, spaced as shown on 320,0 (12.598) pcd ◆
5 holes Ø 20,0 (0.79 dia) equi-spaced as shown on 327,03 (12.875) pcd and spotfaced to Ø 38,0 (1.5 dia)
26,19 (1.031)
4 holes, see table for bolt tappings
52,37 (2.062)
1" code 61 SAE ports (2 positions)
59,0 (2.35)
21,0 (0.82)
29,0 (1.13)
Ø80,0 (3.13 dia) x 10,0 (0.41) thick end plate and 3 fixing bolts supplied with motor
84,0 (3.31)
84,0 (3.31)
Rear-mount spigot Ø270,00/269,93 (10.630/10.627 dia)
Front-mount spigot Ø 301,57/301,50 (11.873/11.870 dia)
Ø 365,0 (14.36 dia) max.
Flow directions for shaft rotation shown. Reverse flow directions for opposite rotation.
15,0 (0.63)
102,0 (4.0)
100,0 (3.94)
℄ of drains
138,0 (5.44)
167,0 (6.6)
Rear mounting face
Front mounting face
For shaft details see "Shaft type "X" applicable to dual-mount" on page 11.

Port flange bolt tappings

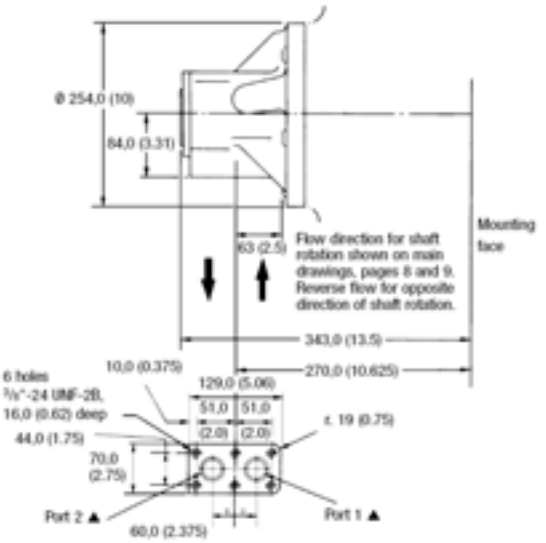
Model code 4	Tapping size
F2	½"-16 UNC-2B x 22,0 (0.87) deep
FM2	M10 x P1.5 x 22,0 (0.87) deep

⌖ Ø 0,15 (0.006)

9

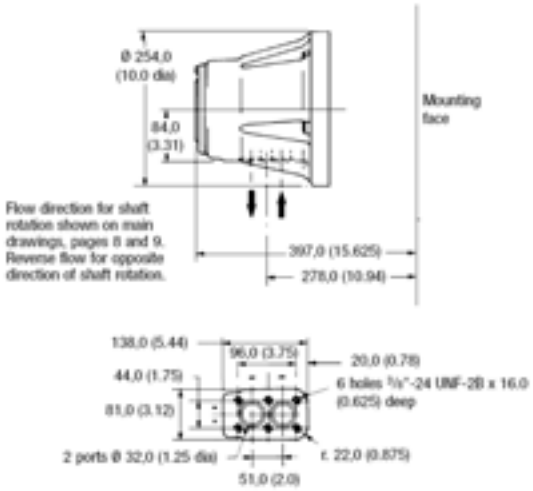
MCCOY MOVING GLOBAL ENERGY FORWARD | DRILLING & COMPLETIONS FARR

3" VALVE HOUSING WITH 6-BOLT FLANGE, "S03" IN MODEL CODE POSITION 4



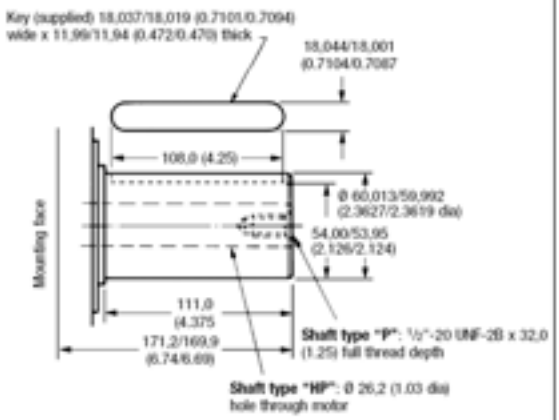
▲ *Ø 28 (1.125 dia) with recess for 31,0 (1.22) i/d x Ø 4 (0.157 dia) section O-ring*

4" VALVE HOUSING WITH 6-BOLT FLANGE, "S04" IN MODEL CODE POSITION 4


Ø 254,0 (10.0 dia)
84,0 (3.31)
Mounting face
Flow direction for shaft rotation shown on main drawings, pages 8 and 9. Reverse flow for opposite direction of shaft rotation.
397,0 (15.625)
278,0 (10.94)
138,0 (5.44)
96,0 (3.75)
20,0 (0.78)
44,0 (1.75)
6 holes 7/8"-24 UNF-2B x 16.0 (0.625) deep
81,0 (3.12)
2 ports Ø 32,0 (1.25 dia)
r. 22,0 (0.875)
51,0 (2.0)

SHAFT TYPES "P" AND "HP", MODEL CODE POSITION 3

Cylindrical shaft with key

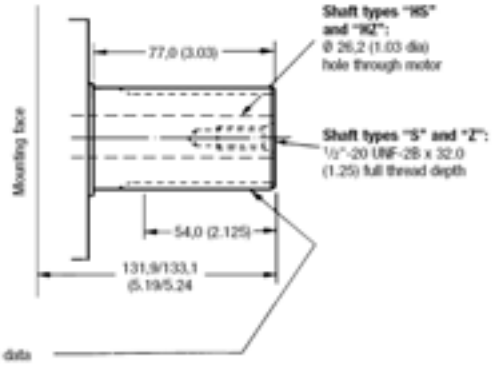


SHAFT TYPES "S" AND "HS", MODEL CODE POSITION 3

Cylindrical shaft with 14 splines to BS 3550-1963

SHAFT TYPES "Z" AND "HZ", MODEL CODE POSITION 3

Cylindrical shaft with splines to DIN 5480


77,0 (3.03)
Shaft types "HS" and "HZ": Ø 26,2 (1.03 dia) hole through motor
Shaft types "S" and "Z": 1/2"-20 UNF-2B x 32.0 (1.25) full thread depth
Mounting face
54,0 (2.125)
131,9/133,1 (5.19/5.24)
Spline data

For shaft types "S" and "HS"
to BS 3550/SAE J499c (ANSI B92.1 1970 class 5)
Flat root side fit, class 1

Pressure angle	30°
Number of teeth	14
Pitch	6/12
Major diameter	62,553/62,425 (2.4627/2.4577)
Form diameter	55,052 (2.1674)
Minor diameter	54,084/53,525 (2.1293/2.1073)
Pin diameter	8,128 (0.3200)
Diameter over pins	71,593/71,544 (2.8186/2.8167)

For shaft types "Z" and "HZ"
DIN 5480, W70 x 3 x 22 x 7h

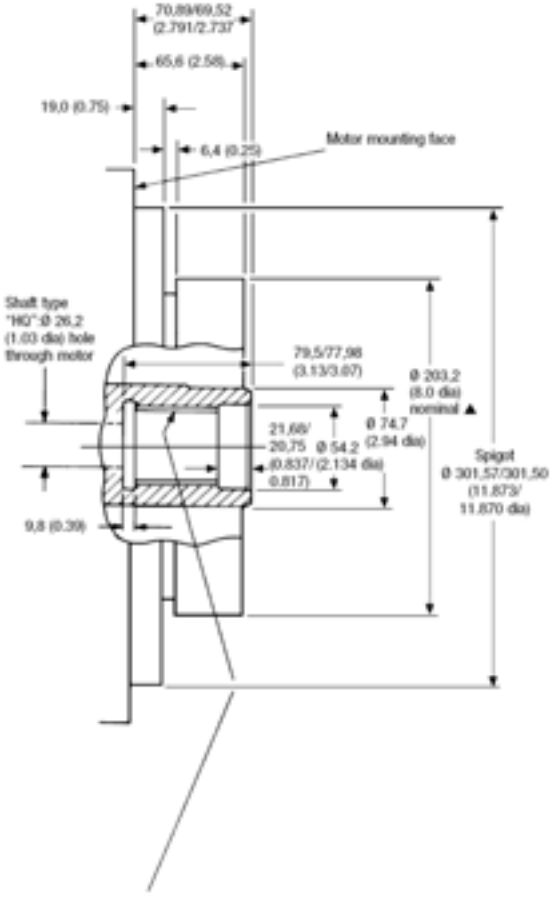
10

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

SHAFT TYPES "Q" AND "HQ", MODEL CODE POSITION 3

Female shaft with 24 splines to BS 3550

Note: The "Q" and "HQ" shafts will transmit the maximum torque given on page 4. However, customers should ensure that their own mating shaft will transmit the torque required in their application.



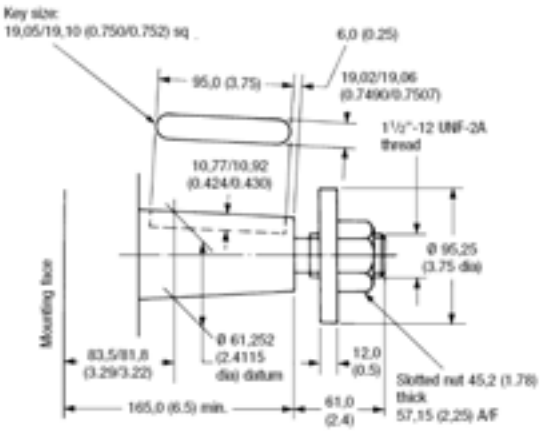
Spline data

To BS 3550	
Flat root side fit, modified	
Pressure angle	30°
Number of teeth	24
Pitch	12/24
Major diameter	53,246/52,916 (2.0963/2.0833)
Minor diameter	48,811/48,684 (1.9217/1.9167)
Pin diameter	3,658 (0.1440)
Pin flatted to	3,560 (0.1400)
Diameter between pins	45,626/45,550 (1.7963/1.7933)

▲ *Use mounting face spigot for motor location*

SHAFT TYPE "T", MODEL CODE POSITION 3

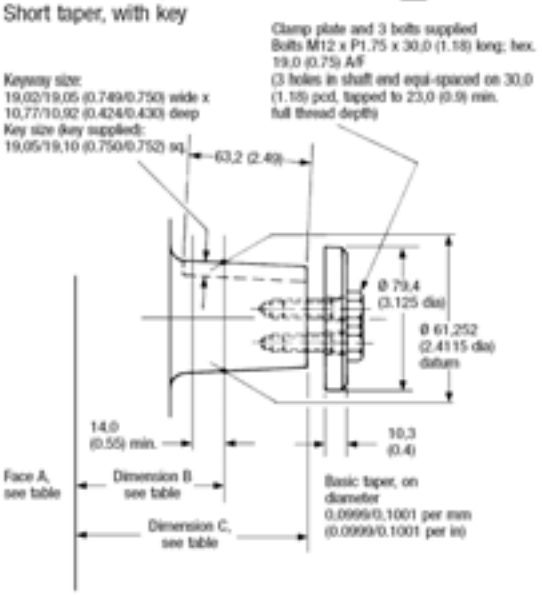
Long taper, with key



Basic taper, on diameter 0,0999/0,1001 per mm (0.0999/0.1001 per in)

SHAFT TYPE "X", MODEL CODE POSITION 3

Short taper, with key


Clamp plate and 3 bolts supplied Bolts M12 x P1.75 x 30,0 (1.18) long; hex. 19,0 (0.75) A/F (3 holes in shaft end equi-spaced on 30,0 (1.18) pcd, tapped to 23,0 (0.9) min. full thread depth)
Keyway size: 19,02/19,05 (0.749/0.750) wide x 10,77/10,92 (0.424/0.430) deep
Key size (key supplied): 19,05/19,10 (0.750/0.752) sq
63,2 (2.49)
Ø 79,4 (3.125 dia)
Ø 61,252 (2.4115 dia) datum
14,0 (0.55) min.
10,3 (0.4)
Face A, see table
Dimension B see table
Dimension C, see table
Basic taper, on diameter 0.0999/0.1001 per mm (0.0999/0.1001 per in)

For front-mount models:		
Face A	=	Front mounting face
Dim. B	=	83,31/81,43 (3.280/3.206)
Dim. C	=	129,4 (5.09)
For dual-mount models:		
Face A	=	Rear mounting face
Dim. B	=	250,8/248,92 (9.874/9.800)
Dim. C	=	297,0 (11.69)

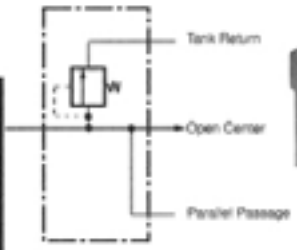
MCCOY DRILLING & COMPLETIONS FARR MOVING GLOBAL ENERGY FORWARD

Inlets (2500 psi)

End Inlet

Code	End Port	Top Port
DVA35-A440	1" NPT	1" NPT
DVA35-A880	SAE-16	SAE-16
DVA35-A980	SAE-20	SAE-16
DVA35-A000	NON-PORTED HOUSING	

NOTE: Inlets are machined for a main R/V or R/V plug and are furnished with plastic closures.
See Section G, Page 32 for inlet port plugs



Schematic shown with main R/V

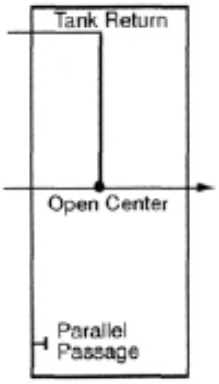
Note: For inlets with solenoid section pilot supply machining, see DVG35 inlet section E1

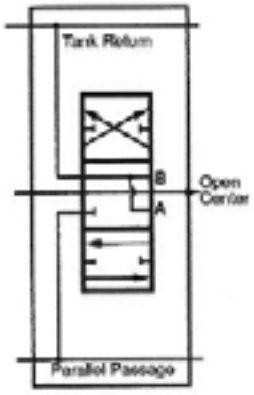
Outlets

Tank Return Type

Code	End Port	Top Port
DVA35-TR55	1 1/4" NPT	1 1/4" NPT
DVA35-TR99	SAE-20	SAE-20
DVA35-TR00	NON-PORTED HOUSING	

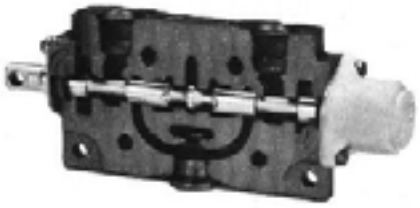
NOTE: See Section G, Page 32 for Port Plugs





MA8

Double-Acting Section
4-Way, 3-Position, Float in Neutral
Motor Spool



Adjustable Relief Valve Cartridges

For Inlets and Mid-section Inlets

Code	Description
DVA35-MRV-1	Main R/V pressure range 800-2000 psi. Factory set @ 1500 psi @ 50 gpm
DVA35-MRV-2	Main R/V pressure range 2001-2500 psi. Factory set @2500 psi @ 50 gpm.
DVA35-MRVP	Main relief valve plug

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Lo-Boy Work Sections -- Parallel Circuits

Code	4-Way 3-Position Hold In Neutral	3-Way 3-Position Hold In Neutral	4-Way 3-Position Float In Neutral	4-Way 4-Position Float Position Detented	Port Size	Work Port NOT Machined	Spring Return	3-Position Detent	Metered Hydraulic Remote Control	Solenoid Operated	Air Shift		
DVA35-DAO	•					•	•						
DVA35-DA4	•				1"NPT		•						
DVA35-DA8	•				SAE-16		•						
DVA35-SAO		•				•	•						
DVA35-SA4		•			1" NPT		•						
DVA35-SA8		•			SAE-16		•						
DVA35-MA0			•			•	•						
DVA35-MA4			•		1" NPT		•						
DVA35-MA8			•		SAE-16		•						
DVA35-DK8-12V	•				SAE-16					• 12 VDC			
DVA35-DK8-24V	•				SAE-16					• 24 VDC			
DVA35-DX4	•				1" NPT				•				
DVA35-DX8	•				SAE-16				•				
DVA35-DV4	•				1" NPT						•		
DVA35-DV8	•				SAE-16						•		
DVA35-MX4			•		1" NPT				•				
DVA35-MX8			•		SAE-16				•				
DVA35-DB4	•				1" NPT			•					
DVA35-DB8	•				SAE-16			•					
DVA35-SB4		•			1"NPT			•					

Note: See Section G, Page 33 for section seal kits.
Codes outside of the shaded area may require increased lead time.
Most codes outside the shaded area can be made from codes inside the area and kits on page 33.
Solenoids are furnished with spade connectors
Machining instructions for standard housings are included in solenoid kits.

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Brief Circuit Descriptions

Series Circuit

Available in DVA20 sections only.

If a machine's work cycle requires simultaneous as well as separate operation of individual hydraulic work functions, a series circuit is right for the job.

As with the other circuits, the oil flows through the open center when all spools are in neutral. There is no parallel passage in standard series sections because they feed directly from the open center passage. If more than one spool is operated, pump flow goes first to the section closest to the inlet. Return flow from the first section is fed back into the open center for use by downstream sections.

Downstream sections can be series, parallel or tandem and will operate in series with the upstream section.

In series circuits, operating pressure is cumulative. Therefore, the sum of the pressures in the circuits can not exceed the circuit or main relief valve setting.

Parallel Circuits

Parallel circuits are the most common on mobile equipment because more than one function can be operated simultaneously and at random. If two or more functions are fully operated at the same time, the one with the lightest load will assert priority because the fluid will take the path of least resistance. However, the operater can divide the flow between functions by metering the spools.

Movement of the spool meters or shuts off the flow of oil thru the open center passage and pressurizes the parallel passage. Oil is then available, at the operator's discretion, to all work ports connected to the parallel passage.

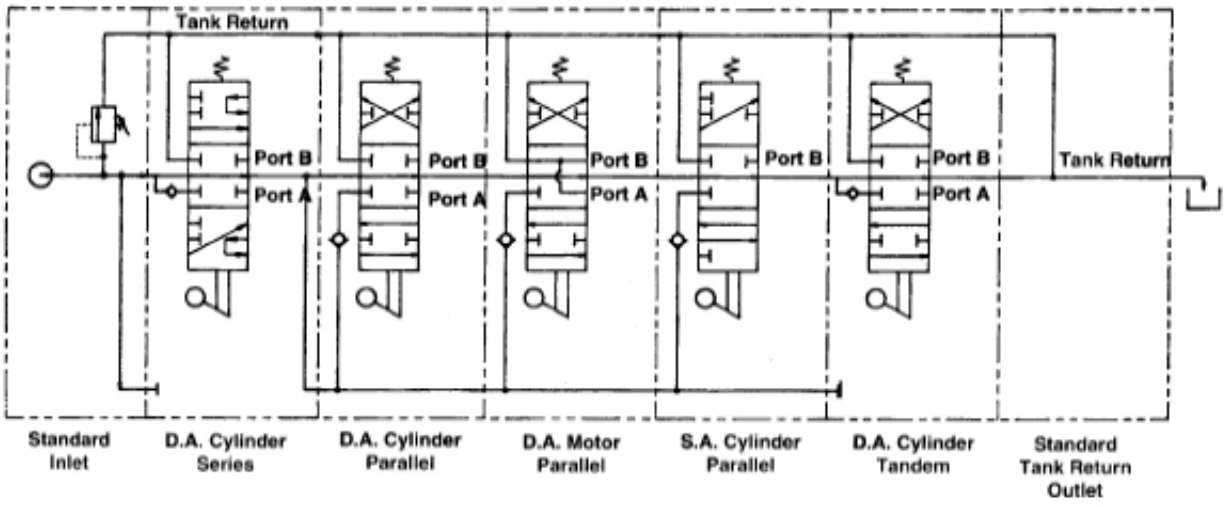
Tandem Circuits

(Not available in the program)

Tandem circuits are sometimes called priority or standard circuits by other manufacturers. Tandem sections feed from the open center passage like series sections but the return flow is directed to the tank return passage and is not available downstream.

If a tandem section is followed by a series or tandem section, operating the tandem section nearest the inlet will assert priority and downstream sections will not function.

Typical Work Section Schematics



DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

VA™/VG™ Valve Service Instructions

INTRODUCTION

This manual has been prepared to assist you in the proper maintenance of the VA20™/VA35™ and VG20™/VG35™/VG80™ directional control valves. Before any work is done, we suggest that you read the assembly and disassembly instructions completely.

The first rule of good maintenance is cleanliness, which includes a clean environment. MAKE SURE YOU DISASSEMBLE AND ASSEMBLE YOUR HYDRAULIC EQUIPMENT IN A CLEAN AREA. Dirt is the natural enemy of any hydraulic system.

GENERAL INFORMATION

The VA and VG model valves are updated versions of our proven A20™ and A35™ units. The VG models are cast from compacted graphite, a high strength iron alloy, which allows the valve to be rated to 3500 psi. VA models are cast from gray iron and are rated at 2500 psi. These open-center, directional-control valves are available in parallel, tandem, and series circuitry. As needed, the sectional, stack-type construction provides flexibility for the addition of subtraction of work sections to an existing valve bank. This design also permits the combination of parallel, tandem, and series circuitry in a single bank. The internal coring of each valve section determines its circuitry and the number of gasket seals required.

All sections with optional features, such as port relief valves, crossover relief valves, and anti-cavitation checks, are dimensionally larger when measured from the top of the port to the bottom of the housing. These are referred to as "hi-boy" sections. Those without work-port options can use the low-profile castings, which are called "lo-boy" sections.

REPLACEMENT PARTS

The illustrations and instructions in this manual apply only to the VA/VG series assemblies, subassemblies, and components. All valve components, except for spools and housings, are available as replacement parts or subassemblies. Spools are hone-fitted to their individual housings, so damage to either of these components means the entire section must be replaced.

We recommend that you use only genuine VA/VG series replacement parts in your service program. Manufactured to the same exacting tolerances and quality controls as the original equipment, genuine VA/VG replacement parts may help prevent premature, component failure and costly downtime. Service parts and assemblies are available through your original equipment dealer or any authorized distributor.

MAINTENANCE

Valves are often used in hazardous environments. Inspect them frequently for damage due to improper use, corrosion or normal wear. If needed, repairs should be made immediately.

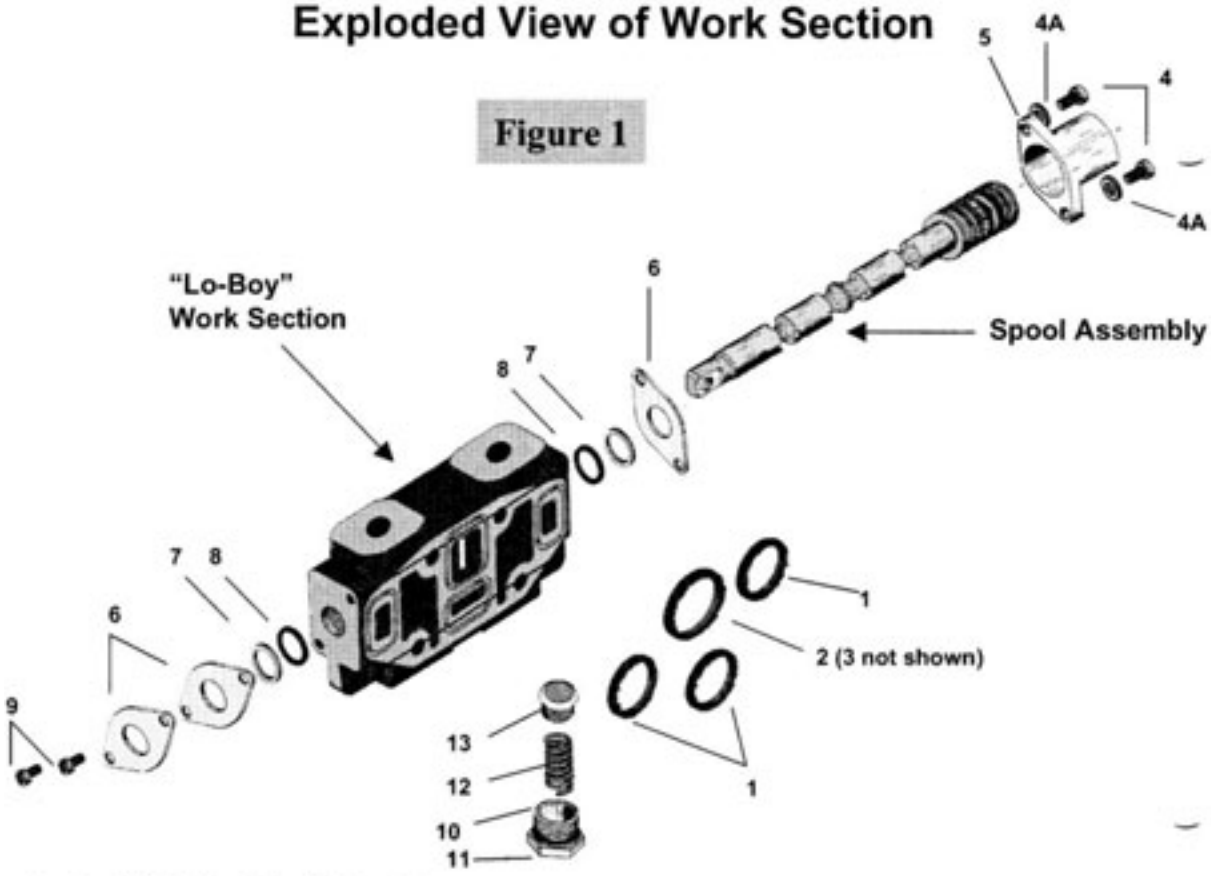
Always refer to the machine manual for the proper procedure to remove the valve from the machine.

Remove the valve bank from the equipment, disconnecting all hoses, fittings, control handles and linkage connectors that might be attached to the valve. Plug all ports and thoroughly clean the exterior of the valve bank, then the port plugs can be removed.

DRILLING & COMPLETIONS | FARR
MCCOY MOVING GLOBAL ENERGY FORWARD

Exploded View of Work Section

Figure 1



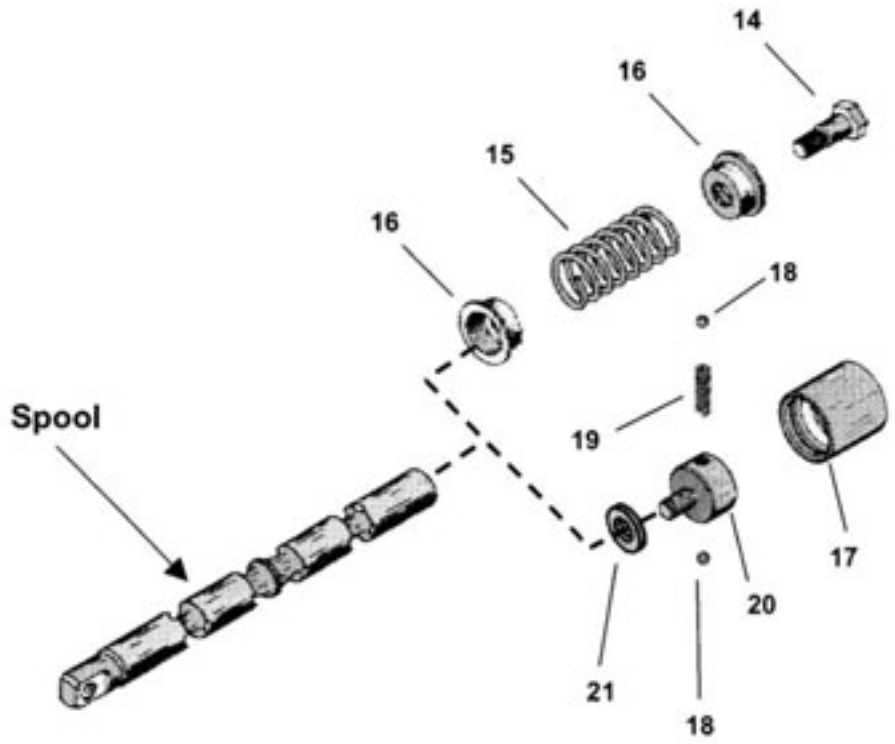
Parts List For Work Section

Item	Description	Qty.	VA/VG20 Part No.	VA/VG35 Part No.	VG80 Part No.
Parallel Section Seals* See Figure 1					
1.	Square Seals	3	391-2881-206	391-2881-200	391-2881-433
2.	Square Seal	1	391-2881-200	391-2881-403	391-2881-670
Series Section Seals					
1.	Square Seals	2	391-2881-206	391-2881-200	.....
3.	Square Seal	1	391-2881-627	391-2881-628	.....
Parallel and Series Section Component Parts. See Figure 1					
4.	Back Cap Screws	2	391-1433-020	391-1433-009	(4) 391-1402-068
4A.	Lock washers	8	.....	.....	391-3783-039
5.	Back Cap	1	341-6000-100	342-6000-100	341-0585-099
6.	Retainer Plates	3	391-2183-001	391-2183-005	391-2183-157
7.	Back up Rings	2	391-2681-378	391-2681-426	391-2681-285
8.	Spool Seals	2	391-1985-014	391-2887-212	391-2881-096
9.	Retainer Plate Screws	2	391-1433-015	391-1433-002	(4) 391-1402-015
10.	Check Valve Cap	1	391-0581-044	391-0581-044	391-0585-099
	Or Valve Cap (F.I.N.)	1	391-2281-015	391-2281-015	.....
11.	O Ring Seal **	1	391-2881-204	391-2881-204	391-2881-249
12.	Check Spring **	1	391-3581-713	391-3581-713	391-3581-778
13.	Check Valve Poppet **	1	391-2481-069	391-2481-069	391-2383-091

*Parallel Sealing Face includes inlets and mid-inlets.
**Not required in Float-in-neutral Sections.

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Figure 2



Spring Centered and Detent Spool Operators. See Figure 2

14.Stripper Bolt	1	391-1432-022	391-1432-021	391-1402-452
15.Centering Spring	1	391-3581-608	391-3581-633	391-3581-330
16.Spring Guides	2	391-1642-045	391-1642-013	391-1642-161
17.Detent Sleeve	1	391-3283-015	391-3283-008	391-3384-310
18.Detent Balls	2	391-0282-010	391-0282-009	391-0282-011
19.Detent Spring	1	391-3581-130	391-3581-015	391-3581-316
20.Detent Poppet Retainer	1	391-2583-008	391-2583-006	391-3384-311
21.Detent Spacer	1	.....	.....	391-3782-208

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Valve Disassembly Instructions

Reference exploded view and parts list on page 2 and 3 for work section detail.

Step 1 - Valve Bank

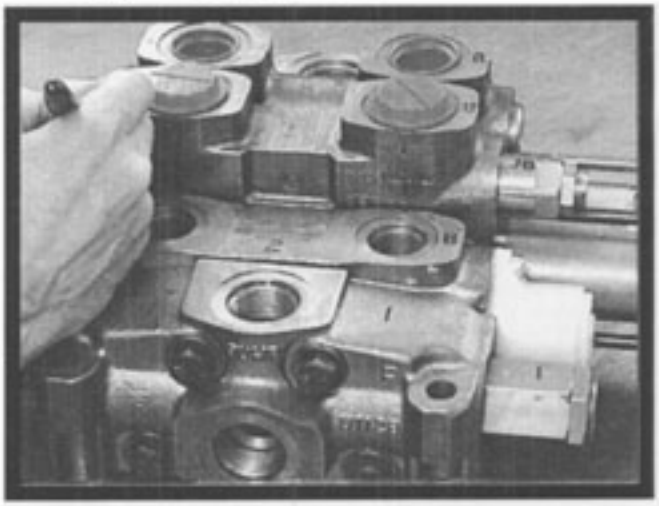
This step is the most critical in the disassembly procedure. It should be followed closely to ensure that the valve bank is properly reassembled after repairs have been made.

With a waterproof, quick-drying marker, mark each casting with a sequential number. Start by marking the inlet casting with the #1 and finish by marking the outlet with the highest number.

Next, mark the port boss closest to the back cap on each work section with a "B" (for back cap end).

Then, mark the port boss closest to the spool clevis on each work section with a "C" (for clevis end).

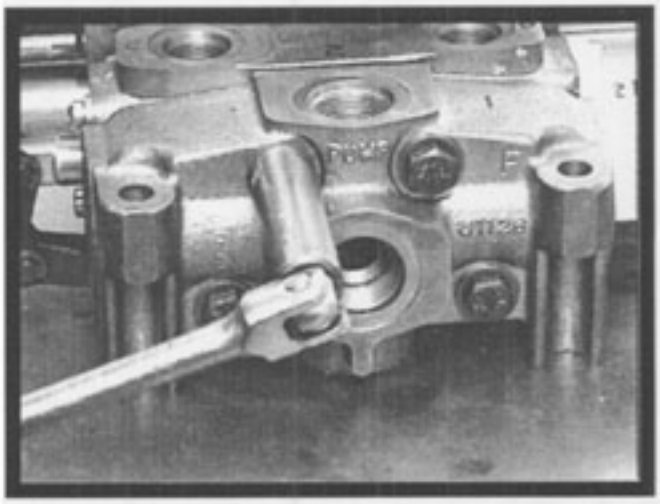
Finally, if relief valves are removed from the valve bank they must be marked with the corresponding number of the casting and port location (B or C) from which they were removed. Inlet and mid-inlet relief valves are marked with a casting number only.



Step 2 - Tie Bolts

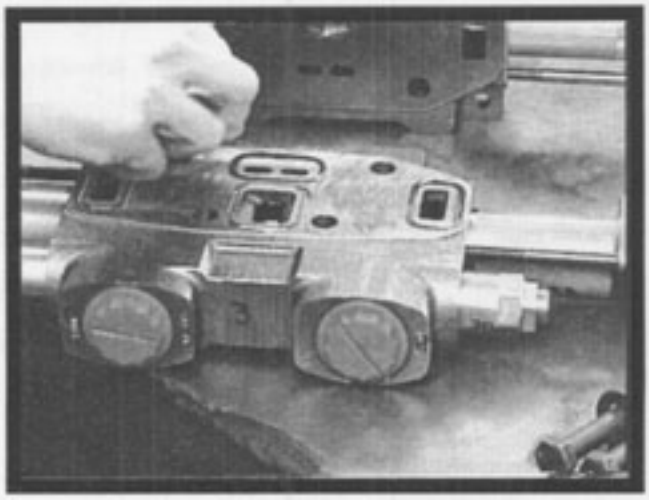
Remove the four, tie bolts that hold the bank together and separate the sections.

NOTE: VA valve tie bolts thread into the outlet casting. VG valve tie bolts pass through the entire bank, requiring washers and hex nuts to be fastened at both ends of the bolt.



Step 3 - Section Seals

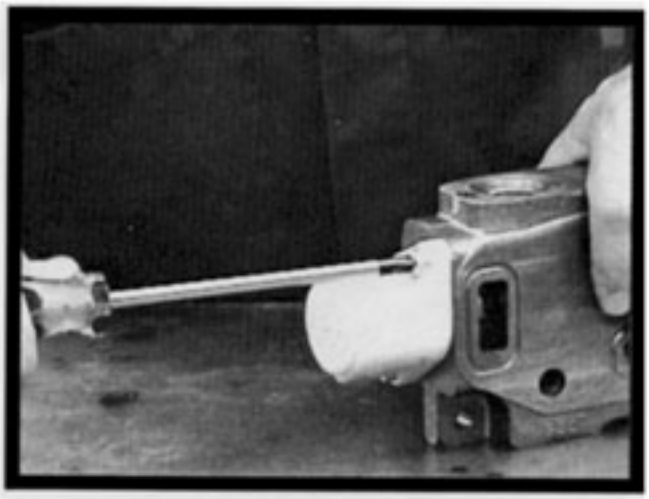
The inlet, mid-inlet and each parallel work section have four, section seals, (Fig. 1, items 1 & 2) on the downstream, mating face. Series work sections and the VA/VG35 split flow mid inlets have three section seals on the downstream mating face, (Fig. 1, items 1 & 3.) These section seals should be removed and discarded.



REMINDER: ALL WORK MUST BE PERFORMED IN A CLEAN AREA.

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Valve Disassembly Instructions



Step 4 - Valve Back Cap

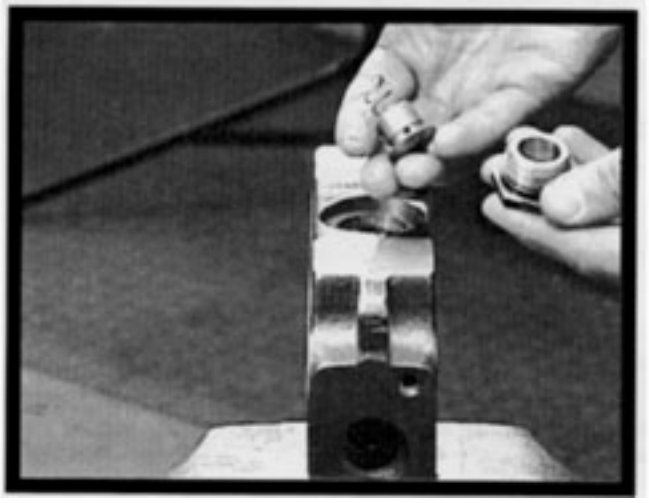
Using a large, Phillips-head screwdriver, remove the two, cap screws (Fig. 1, item 4) which fasten the back cap to the work section. Lightly tap the end of the screwdriver handle with a hammer to break adhesive. Remove the back cap (Fig. 1, item 5).

Step 5 - Control Spool and Seals

Grasp the spring end of the spool with a clean, lint-free cloth and pull the spool out of the housing using a twisting motion. Generally, the rear, retainer plate (Fig. 1, item 6) back-up ring (Fig. 1, item 7) and spool seal (Fig. 1, item 8) will come out with the spool.

CAUTION: For detented spool models, be careful not to remove the detent poppet sleeve (Fig. 2, item 17) unless it is to be serviced.

Using a large, Phillips-head screwdriver, remove the two, retainer-plate screws (Fig. 1, item 9) from the spool clevis end of the work section. Lightly tap the end of the screwdriver handle with a hammer to break the adhesive. Remove the two, retainer plates (Fig. 1, item 6) the back-up ring (Fig. 1, item 7) and the spool seal (Fig. 1, item 8). Tag or mark with the appropriate, work section identification number. (See Step 1.) Spool seals (Fig. 1, item 8) and back-up rings (Fig. 1, item 7) should be discarded.



Step 6 - Transition Check

The transition check is located in the bottom center of the work section housing. Carefully clamp the work section in a vise with ports down. Do not clamp on the machined surface. Remove the check-valve cap (Fig. 1, item 10) and its O-ring seal (Fig. 1, item 11). Discard the seal. Remove the check spring (Fig. 1, item 12,) and the check-valve poppet (Fig. 1, item 13).

NOTE: Only cylinder work sections (ports blocked in neutral) have a transition check. Motor sections have only a cap plug.

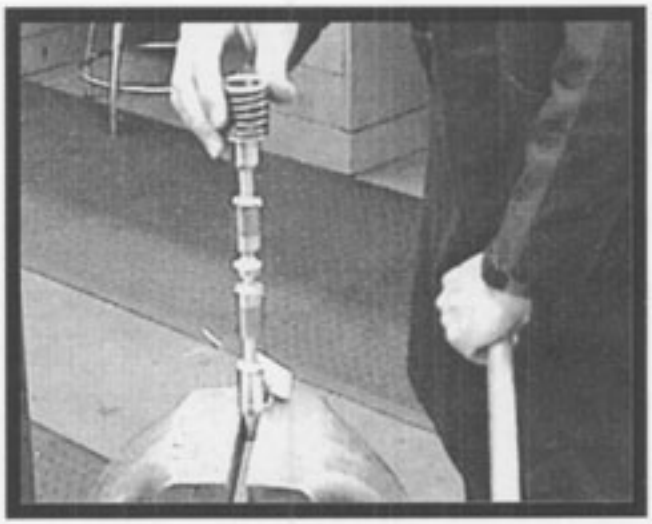
MCCOY | DRILLING & COMPLETIONS
MOVING GLOBAL ENERGY FORWARD
FARR

Valve Disassembly Instructions

Spool Disassembly

Spring Centered Spool

The spring assembly should not be removed from the spool unless these parts need to be replaced. Once the spool is free of the work section housing, it must be handled carefully to avoid damage. Place the spool vertically in a soft-jawed vise, clamping on the flat, spool clevis, and remove the stripper bolt (Fig. 1, item 14) with a wrench.



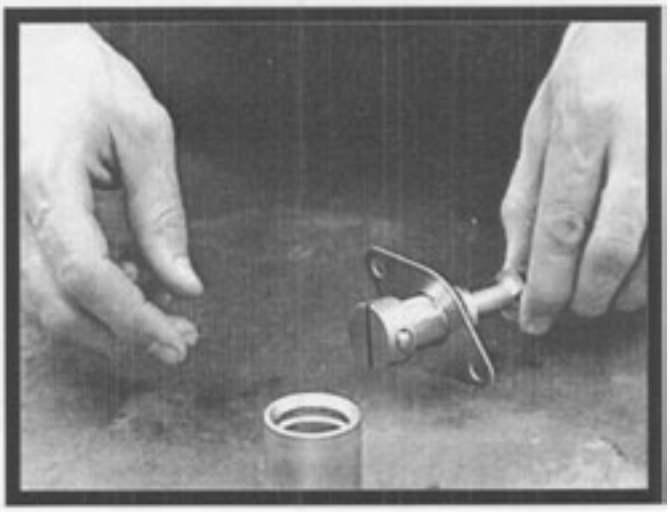
Lightly tap the stripper bolt with a hammer and a punch to help break the adhesive. Cautious application of heat may be required to free the stripper bolt, since an anaerobic thread adhesive was used during its assembly.

CAUTION: Too much heat may distort the spool.

As the stripper-bolt threads disengage, the spring (Fig. 2, item 15) and spring guides (Fig. 2, item 16) will release abruptly from the spool.

Detent Spool

The detent assembly should not be removed from the spool unless these parts need to be replaced. Wrap the detent sleeve (Fig. 2, item 17) with a clean, lint-free cloth. Grip the cloth-covered sleeve and pull firmly. As the sleeve moves backwards, the detent balls (Fig. 2, item 18) and the detent spring (Fig. 2, item 19) will release abruptly. The cloth should capture these parts and prevent their loss.



Next, clamp the spool in a soft-jawed vise and remove the detent poppet retainer (Fig. 2, item 20). Place an undersized bar through the detent ball bore to serve as a wrench. Lightly tap the detent poppet retainer with a hammer and a punch to help break the adhesive. Cautious application of heat may be required again, since an anaerobic adhesive was also used in the detent retainer assembly.

CAUTION: Too much heat may distort the spool!

CLEANING, INSPECTION, AND REPAIR

1. Inspect the spool bore, transition check seat and spool from each section for deep scratches, gouges or excessive wear. If any of these conditions exist, replace the section. Minor, surface damage on the control spool and check poppet can be carefully polished away with a very fine, crocus cloth.

2. Examine the machined surfaces of the valve housing for nicks and burrs that could cause leakage between sections. Lightly stone these surfaces to remove any rough spots.

CAUTION: A shallow-milled relief area extends across the O-ring face of the valve housing. This should not be stoned or ground off!

3. Wash all parts thoroughly in a cleaning solvent and blow dry before beginning reassembly. Pay special attention to the number and letters marked on the parts in Step 1. If any marks are removed during cleaning, re-mark immediately.

4. Clean adhesive from threads of spool, stripper bolt, housing, cap screws and hex nut with Loctite™ Chisel Gasket Remover.

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

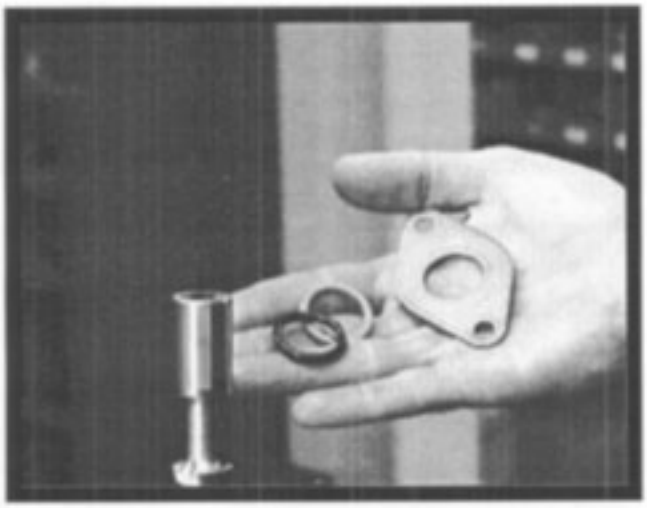
Valve Assembly Instructions

Preparation of Parts

Spray the threads of the new stripper bolt (Fig. 2, item 14) tapped-threaded spool end, all screws and screw holes on both ends of the housing with LOCQUIC Primer Grade NF™ and let dry.

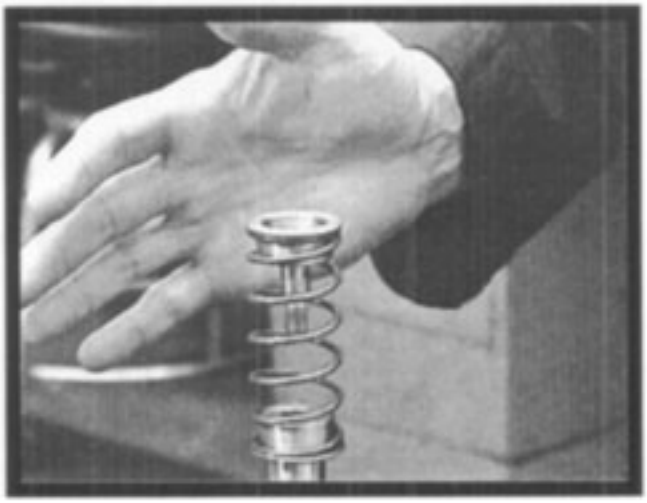
CAUTION: Failure to follow the recommended assembly instructions can result in poor performance or product malfunction. Product should be thoroughly tested to ensure proper operation before the valve is placed back into service.

Spring Center Spool Assembly



Step 1 - Spool Assembly-Spring Centered

Clamp the flat, clevis end of the control spool in a soft jawed vise. Apply Parker Super-O-Lube™ to the spool seal (Fig. 1, item 8) and slide it onto the end of the spool away from the clevis. Slide on the back-up ring (Fig. 1, item 7) and retainer plate (Fig. 1, item 6). Position these items onto the spool, so that they do not interfere with the spool operator mechanism during assembly. Do not allow the O-ring to come in contact with the sharp edge of the spool notches.



Step 2 - Attach Spring Guides and Spring

Apply 2 - 3 drops of Loctite 262™ or equivalent anaerobic adhesive near the middle of the female threads in the spool. Assemble the spring guides (Fig. 2, item 16) centering spring (Fig. 2, item 15) and stripper bolt (Fig.2, item 14,) onto the spool (Reverse of Step 7). Torque the stripper bolt to 175 in. lbs. +/-4 in. lbs.

CAUTION: Care must be taken to ensure that the spring retainer is not pinched under the shoulder bolt during assembly. This can result in burrs that may cause spool binding. Check for binding by compressing the spring and guides or by rotating the spring guide nearest the housing.

CAUTION: Follow the adhesive manufacturer's instructions for proper cleaning and curing. Failure to clean and prepare parts properly may result in assembly failure!

Lightly coat the centering spring with high- temperature grease to prevent rusting. Set the spool assembly aside and let it cure for a minimum of 1 hour. After curing, test the stripper bolt to make certain it can withstand 125 in. lbs. of breakaway torque.

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Valve Assembly Instructions

Detent Spool Assembly

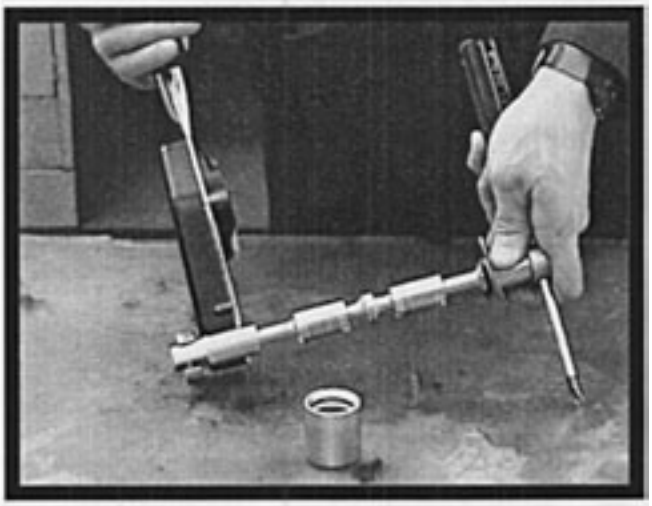
Step 1 - Spool Assembly-Detent

Apply Parker Super-O-Lube™ to the spool seal (Fig. 1, item 8) and slide it onto the spool. Slide the back-up ring (Fig. 1, item 7) and one, retainer plate (Fig. 1 item 6) onto the spool. Position these items onto the spool, so that they do not interfere with the spool operator mechanism during assembly. Do not allow the O-ring to come in contact with the sharp edge of the spool notches. Apply 2 - 3 drops of Loctite 262™ or an equivalent, anaerobic adhesive near the middle of the female threads in the spool.

CAUTION: Follow the adhesive manufacturer's instructions for proper cleaning and curing. Failure to clean and prepare parts properly may result in assembly failure.

Step 2 - Spool Assembly-Detent

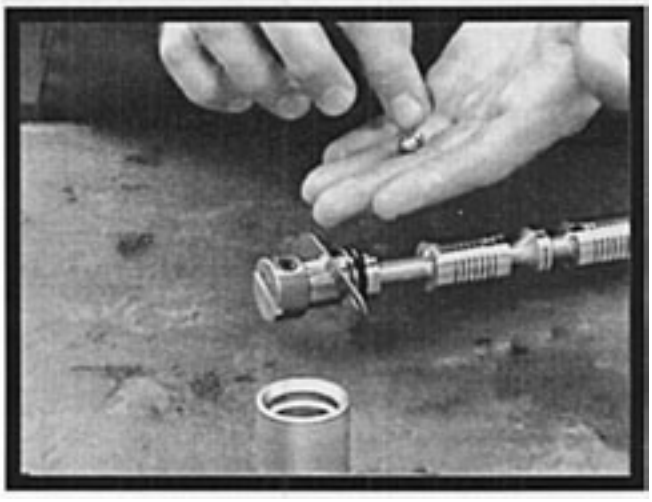
Thread the detent ball retainer (Fig. 2, item 20) into the spool end. Torque the detent ball retainer to 175 in. lbs. +/-4 in. lbs.. This can be accomplished by using a crows-foot socket on the flats of the clevis, and holding the spool by inserting a round, steel rod or screwdriver through the hole in the ball retainer.



Step 3 - Detent Balls and Spring

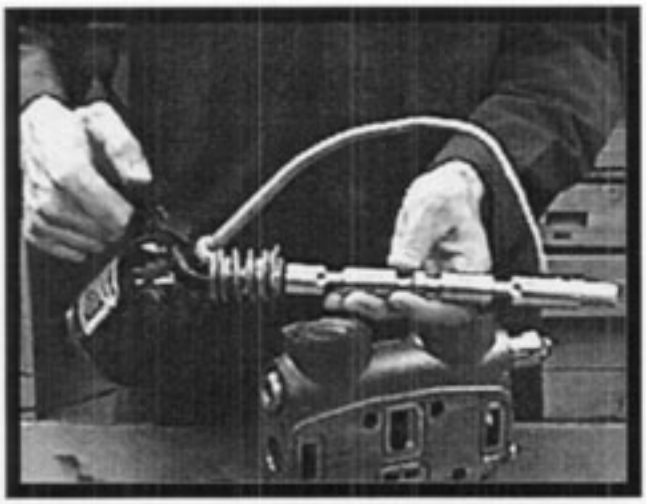
Next, lightly coat the detent balls (Fig. 2, item 18) detent spring (Fig. 2, item 19) and entire inside diameter of the detent sleeve (Fig. 2, item 17) with high-temperature grease.

Insert the detent spring into the through hole in the detent ball retainer. Place the steel balls on the ends of the spring. Compress the balls and spring, then slip on the detent sleeve. (Note: The detent sleeve is not symmetrical; one end of the sleeve has a lead-in chamfer. This chamfer must face the spool clevis when assembled.) Move the detent sleeve to the neutral or middle position to prevent the subassembly from separating during subsequent steps.



DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

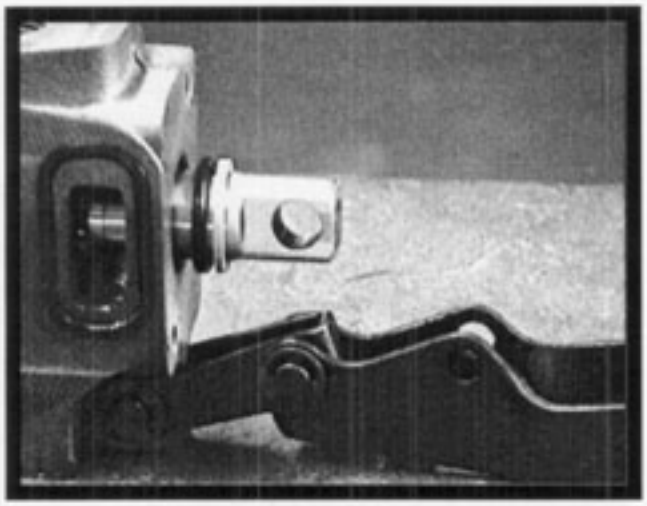
Valve Assembly Instructions



Step 1 - Spool Subassembly

Apply 2 - 3 drops of Loctite 262™ or equivalent to the fillister screw holes on both ends of the housing.

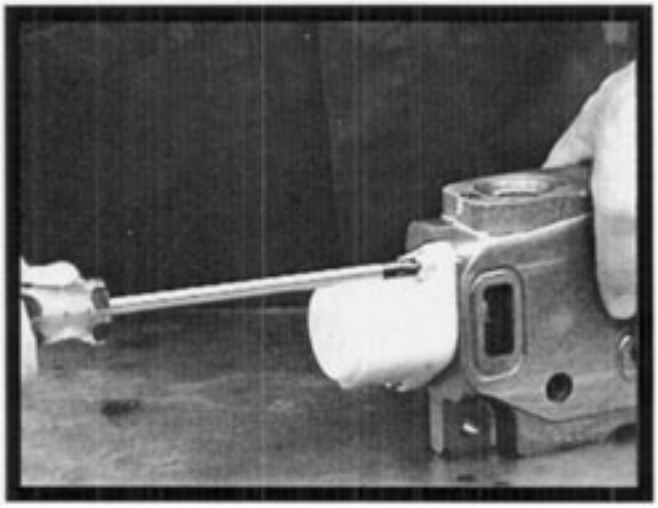
Apply a light coating of clean, hydraulic oil to the valve spool. Carefully insert the spool assembly into the housing. Use caution to avoid causing burrs. Be careful not to pinch, roll or damage the seals. Make sure that the spool and housing are in the proper orientation (see Step 1, page 6 disassembly).



Step 2 - Spool Seal and Back up

Apply Parker Super-O-Lube™ to the spool seal (Fig. 1, item 8) and slide it onto the spool. Slide on the back-up ring (Fig. 1, item 7). Push both items into the counter-bore until they bottom out.

Assemble the two, front, retainer plates (Fig. 1, item 6) using the two short, fillister screws (Fig. 1, item 9). Check retainer plates for proper alignment. Tighten to a final torque of 34 in. lbs. +/- 2 in. lbs..



Step 3 - Back cap

Install the back cap using the two, long, fillister screws (Fig. 1, item 4). Tighten to a final torque of 34 in. lbs. +/- 2 in. lbs.

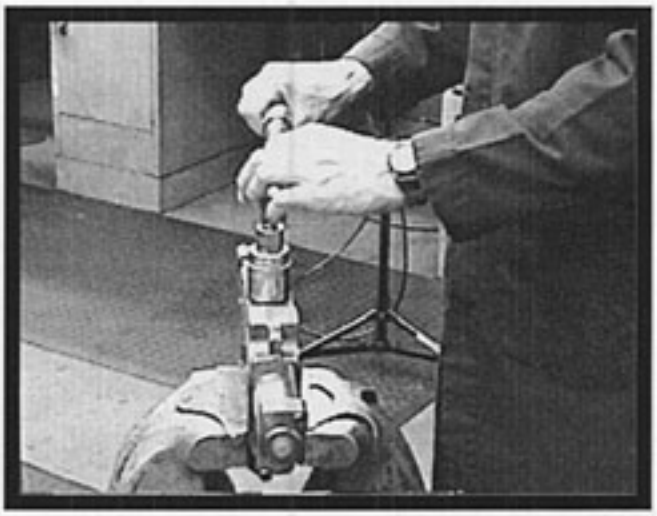
Caution: Excessive torque will damage the back cap ears!

MCCOY DRILLING & COMPLETIONS | FARR
MOVING GLOBAL ENERGY FORWARD

Valve Assembly Instructions

Step 4 - Install Transition Check

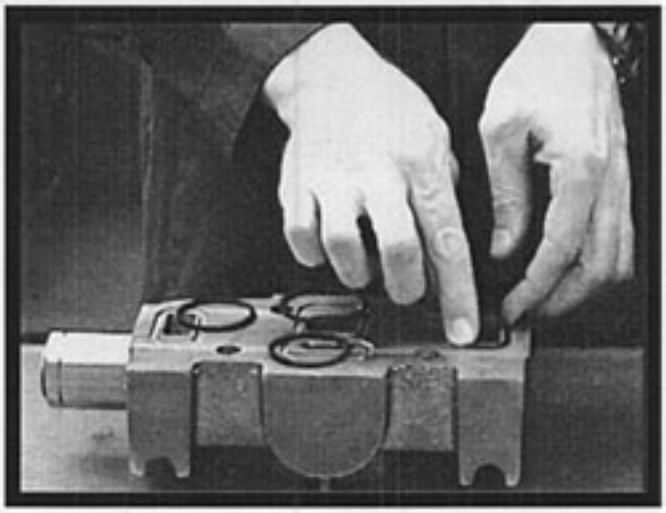
Inspect transition check components for cleanliness. Install check poppet (Fig. 1, item 13) into the transition check cavity. Align the check spring (Fig. 1, item 12) square to the poppet, then carefully place the check cap (Fig. 1, item 11) over the poppet and spring. Turning by hand, engage several threads. Tighten to a final torque of 75 ft. lbs. +/-4ft. lbs..



Step 5 - Relief Valves

Return all relief valves to their proper positions and torque to 75 ft. lbs.

Install new, section seals. Place section seals (Fig. 1, items 1 & 2, or items 1 & 3) in the proper grooves. Make certain seals stay in their grooves during assembly.



Step 6 - Install Tie Bolts

Slide the tie bolts through the inlet casting. If cap screws are used, place a washer on the cap screw prior to installation. Place the valve sections on the tie bolts in their proper sequence (see Step 1, page 4). Turning by hand, engage several threads in the outlet. If it is a VG series assembly, assemble nut and washer to either end of the stud and follow above instructions. Torque the tie bolts in a cross-corner pattern.

Tie Bolt Torque Values

VA20 - 29 ft. lbs. (348 in. lbs.)
VG20 - 42 ft. lbs. (504 in. lbs.)
VA35 - 34 ft. lbs. (408 in. lbs.)
VG35 - 75 ft. lbs. (900 in. lbs.)
VG80 - 150 ft. lbs. (1800 in. lbs.)

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Troubleshooting

TROUBLE	PROBABLE CAUSE	REMEDY
Oil leaks between sections	Pinched, blown or missing section seal	Replace section seal
	Stud fasteners not correctly torqued	Replace section seals and re-torque
	Mounting plate not level	Loosen mounting bolts and shim as required
	Contamination/burrs on seal	Clean seal groove, replace section seal
Oil leaks at either end of spool	Over-pressurized tank core	Correct high, back-pressure condition
	Worn or damaged spool seals	Replace seals and seal retainers
Spring - centered spools do not return to neutral	Broken centering spring	Replace centering spring
	Misalignment of operating linkage	Check linkage for mechanical binding
	Foreign particles in system	Clean valve and system
Load will not hold	Cylinder leaking or worn	Check cylinder - repair
	Port relief valve not holding	Remove and clean or replace
	Spool or housing scored or worn excessively	Replace section
Load drops when spool moved from neutral	Dirt or foreign particles lodged between check-valve poppet and seat	Disassemble, clean & reassemble
	Scored or sticking check-valve poppet	Replace poppet
No motion, slow, or erratic system operation	Worn pump	Check flow & pressure
	Defective cylinder or motor	Repair or replace
	Low-reservoir oil level	Add oil to specifications
	Clogged suction strainer	Clean or replace
	Suction line restricted	Check lines
	Relief valve not properly set	Check pressure setting
	Relief valve poppet or seat scored & sticking open	Replace relief valve
	Valve spool not shifted to full stroke	Check spool linkage travel

MCCOY DRILLING & COMPLETIONS
MOVING GLOBAL ENERGY FORWARD
FARR

3:1 pilot ratio, standard capacity counterbalance valve

Capacity:
15 gpm (60 L/min.)

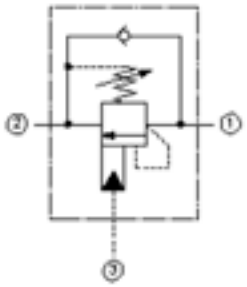
Functional Group:
Products : Cartridges : Counterbalance : 3-Port Non-vented : Standard, 3:1 Pilot Ratio

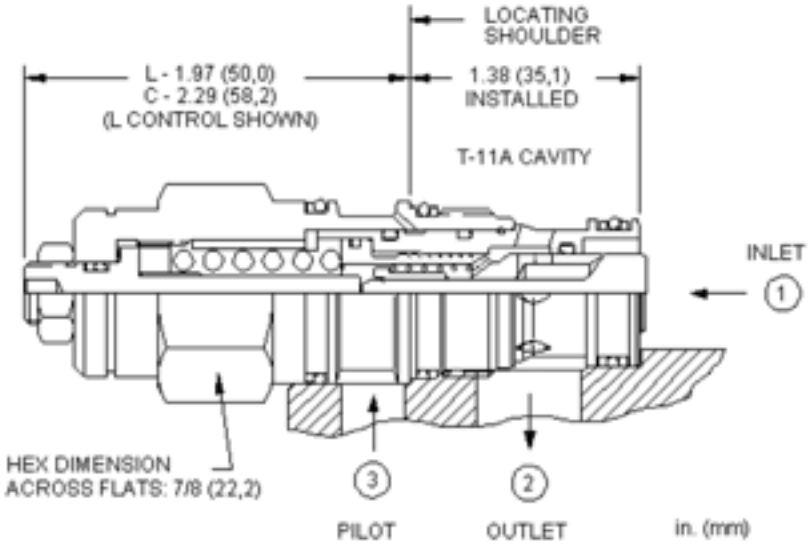
Model:
CBCA

Product Description

Counterbalance valves with pilot assist are meant to control an overrunning load. The check valve allows free flow from the directional valve (port 2) to the load (port 1) while a direct-acting, pilot-assisted relief valve controls flow from port 1 to port 2. Pilot assist at port 3 lowers the effective setting of the relief valve at a rate determined by the pilot ratio.

Other names for this valve include motion control valve and over center valve.





Technical Features

- Counterbalance valves should be set at least 1.3 times the maximum load induced pressure.
- Full clockwise setting is less than 200 psi (14 bar).
- Reseat exceeds 85% of set pressure when the valve is standard set. Settings lower than the standard set pressure may result in lower reseat percentages.
- Turn adjustment clockwise to decrease setting and release load.
- Backpressure at port 2 adds to the effective relief setting at a ratio of 1 plus the pilot ratio times the backpressure.
- Sun counterbalance cartridges can be installed directly into a cavity machined in an actuator housing for added protection and improved stiffness in the

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

- Two check valve cracking pressures are available. Use the 25 psi (1,7 bar) check unless actuator cavitation is a concern.
- All 3-port counterbalance, load control, and pilot-to-open check cartridges are physically interchangeable (i.e. same flow path, same cavity for a given frame size).
- Incorporates the Sun floating style construction to eliminate the effects of internal parts binding due to excessive installation torque and/or cavity/cartridge machining variations.

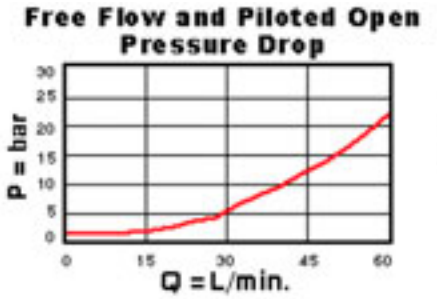
circuit.

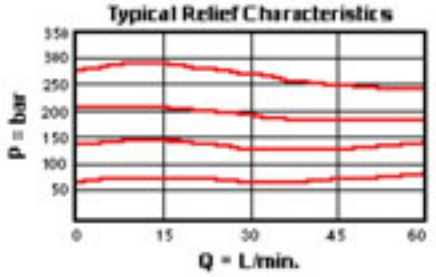
- This valve does not have positive seals on the pilot section and will pass up to 2 inÅ³/min.@1000 psi (32 cc/min.@70 bar) between port 2 and port 3. This is a consideration in master-slave circuits and in the leak testing of valve-cylinder assemblies.
- Stainless steel cartridge options P or W are intended for use within corrosive environments with all external components manufactured in stainless steel or titanium. Internal working components remain the same as the standard valves.

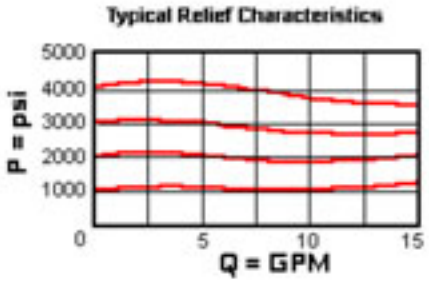
Technical Data

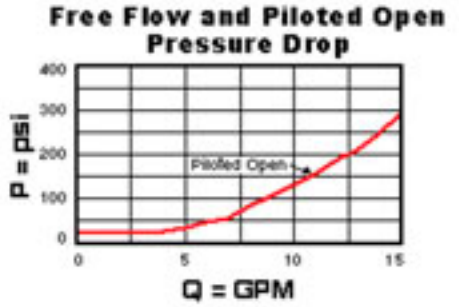
	U.S. Units	Metric Units
Cavity	T-11A	
Capacity	15	60 L/min.
Pilot Ratio	3:1	
Load Holding Units	3075	215 bar
Load Holding Valve Setting Units	4000	280 bar
Adjustment - Number of Counterclockwise Turns to Increase Setting	3.75	
Factory Pressure Settings Established at	2	30 cc/min.
Maximum Valve Leakage at Reseat	5	0,4 cc/min.
Series (from Cavity)	1	
Reseat	>85% of Set Pressure	
Valve Hex Size	7/8	22,2 mm
Valve Installation Torque	30 - 35	45 - 50 Nm
Adjustment Screw Hex Socket Size	5/32	4 mm
Adjustment Nut Hex Size	9/16	15 mm
Adjustment Nut Torque	108	12 Nm
Model Weight	.40	0,20 kg
Seal Kits	Buna: 990-011-007	
Seal Kits	Viton: 990-011-006	

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD









Option Selection

CBCA-L H N

Preferred Options

Control	*Functional Setting Range*	*External Material/Seal Material*
L Standard Screw Adjustment	**H** 1000 - 4000 psi w/25 psi Check (70 - 280 bar w/1,7 bar Check), 3000 psi (210 bar) Standard Setting	**N** Buna-N

Standard Options

C* Tamper Resistant - Factory Set	**A** 1000 - 4000 psi w/4 psi Check (70 - 280 bar w/0,3 bar Check), 3000 psi (210 bar) Standard Setting	**P** Stainless/Buna-N
	B 400 - 1500 psi w/4 psi Check (30 - 105 bar w/0,3 bar Check), 1000 psi (70 bar) Standard Setting	**V** Viton
	I 400 - 1500 psi w/25 psi Check (30 - 105 bar w/1,7 bar Check), 1000 psi (70 bar) Standard Setting	**W** Stainless/Viton

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

Pilot-to-open, spring biased closed, unbalanced poppet logic element

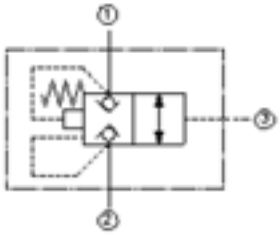
Capacity:
60 gpm (240 L/min.)

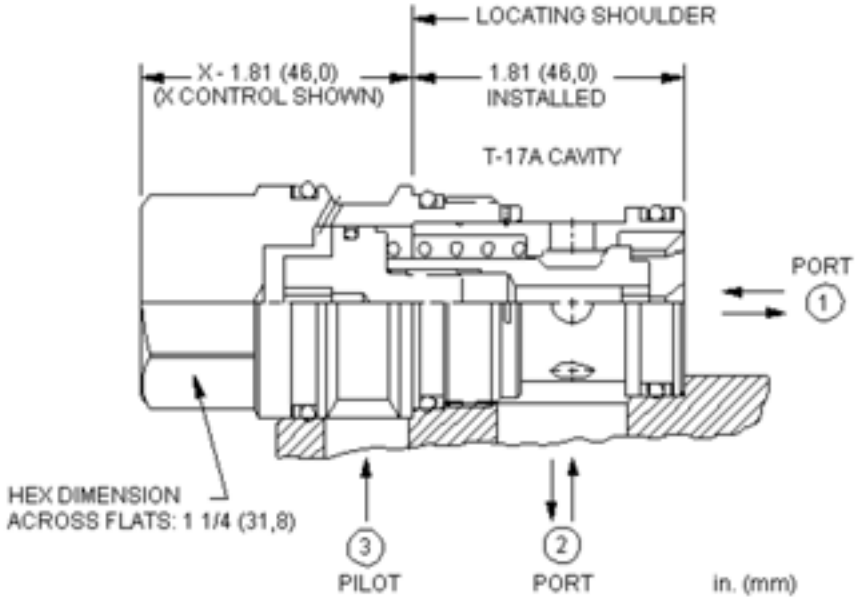
Functional Group:
Products : Cartridges : Corrosion Resistant : Logic Element : Unbalanced Poppet, Pilot-to-open, Switching Element, Spring biased closed, External Pilot Port 3 pilot source

Model:
LKHC

Product Description

These unbalanced poppet, logic valves are 2-way switching elements that are spring-biased closed. Pressure at either work port 1 or 2 will further bias the valve to the closed position while pressure at port 3 will tend to open it. The force generated at port 3 must be greater than the sum of the forces acting at port 1 and port 2 plus the spring force for the valve to open. NOTE: The pilot area (port 3) is 1.8 times the area at port 1 and 2.25 times the area at port 2.





Technical Features

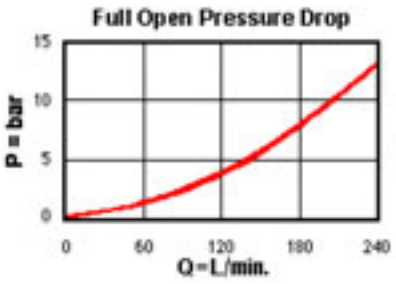
- Because these valves are unbalanced, operation is pressure dependent. Opening and closing of the poppet are functions of the force balances on three areas: 1) Port 1 = 100%, Port 2 = 80%, and Port 3 = 180%.
- These valves are pressure responsive at all three ports, therefore it is essential to consider all aspects of system operation through a complete cycle. Pressure changes at any one port may cause a valve to switch from a closed to an open position, or vice versa. All possible pressure changes in the complete circuit must be considered to assure a safe, functional system design.

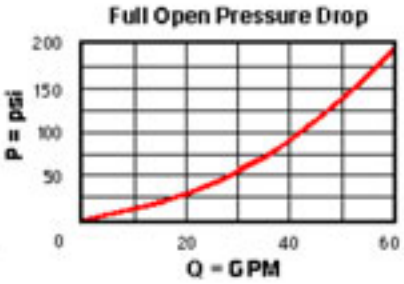
DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD

- These valves have positive seals between port 3 and port 2.
- Stainless steel cartridge options P or W are intended for use within corrosive environments with all external components manufactured in stainless steel or titanium. Internal working components remain the same as the standard valves.
- Incorporates the Sun floating style construction to eliminate the effects of internal parts binding due to excessive installation torque and/or cavity/cartridge machining variations.

Technical Data

	U.S. Units	Metric Units
Cavity	T-17A	
Capacity	60	240 L/min.
Area Ratio, A3 to A1	1.8:1	
Area Ratio, A3 to A2	2.25:1	
Maximum Operating Pressure	5000	350 bar
Maximum Valve Leakage at 110 SUS (24 cSt)	10	10 drops/min.@70 bar
Pilot Volume Displacement	.15	2,5 cc
Series (from Cavity)	3	
U.S. Patent #	4,795,129	
Valve Hex Size	1 1/4	31,8 mm
Valve Installation Torque	150 - 160	200 - 215 Nm
Seal Kits	Buna: 990-017-007	
Seal Kits	Viton: 990-017-006	





Option Selection

LKHC-X D N

Preferred Options

Control	*Cracking Pressure*	*External Material/Seal Material*
Standard Options		
X Not Adjustable		**N** Buna-N **V** Viton

DRILLING & COMPLETIONS
FARR
MCCOY
MOVING GLOBAL ENERGY FORWARD